INTERNATIONAL STANDARD

ISO 14064-1

Second edition
2018-12

Greenhouse gases —

Part 1: Specification with guidance at the organization level for quantification and reporting of greenhouse gas emissions and removals

Gaz à effet de serre —

Partie 1: Spécifications et lignes directrices, au niveau des organismes, pour la quantification et la déclaration des émissions et des suppressions des gaz à effet de serre

Reference number
ISO 14064-1:2018(E)

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Published in Switzerland

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Foreword

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

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

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

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

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

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

This second edition cancels and replaces the first edition (ISO 14064-1:2006), which has been technically revised.

The main changes compared to the previous edition are as follows.

— A new approach has been introduced to reporting boundaries, facilitating the inclusion and expansion of indirect emissions. This change is a response to a growing number of organizations that are recognizing the importance and significance of indirect emissions and are developing GHG inventories that include more types of indirect emissions across the value chain.

— The GHG emissions category “other indirect GHG emissions” has been renamed “indirect GHG emissions.” Requirements and guidance have been provided for classification of indirect GHG emissions into five specific categories. “Operational boundaries” has been renamed “reporting boundaries” for clarification and simplicity.

— New requirements and guidance for GHG quantification and reporting of specific items, such as the treatment of biogenic carbon and GHG emissions related to electricity, have been added for clarification.

A list of all parts in the ISO 14064 series can be found on the ISO website.

This document is the generic standard for the quantification and reporting of greenhouse gas emission and removals at an organizational level.

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

Introduction

0.1 Background

Climate change arising from anthropogenic activity has been identified as one of the greatest challenges facing the world and will continue to affect business and citizens over future decades.

Climate change has implications for both human and natural systems and could lead to significant impacts on resource availability, economic activity and human wellbeing. In response, international, regional, national and local initiatives are being developed and implemented by public and private sectors to mitigate greenhouse gas (GHG) concentrations in the Earth's atmosphere, as well as to facilitate adaptation to climate change.

There is a need for an effective and progressive response to the urgent threat of climate change on the basis of the best available scientific knowledge. ISO produces documents that support the transformation of scientific knowledge into tools that will help address climate change.

GHG initiatives on mitigation rely on the quantification, monitoring, reporting and verification of GHG emissions and/or removals.

The ISO 14060 family provides clarity and consistency for quantifying, monitoring, reporting and validating or verifying GHG emissions and removals to support sustainable development through a low-carbon economy and to benefit organizations, project proponents and interested parties worldwide. Specifically, the use of the ISO 14060 family:

— enhances the environmental integrity of GHG quantification;

— enhances the credibility, consistency and transparency of GHG quantification, monitoring, reporting, verification and validation;

— facilitates the development and implementation of GHG management strategies and plans;

— facilitates the development and implementation of mitigation actions through emission reductions or removal enhancements;

— facilitates the ability to track performance and progress in the reduction of GHG emissions and/or increase in GHG removals.

Applications of the ISO 14060 family include:

— corporate decisions, such as identifying emission reduction opportunities and increasing profitability by reducing energy consumption;

— risks and opportunities management, such as climate-related risks, including financial, regulatory, supply chain, product and customer, litigation, reputational risks and its opportunity for business (e.g. new market, new business model);

— voluntary initiatives, such as participation in voluntary GHG registries or sustainability reporting initiatives;

— GHG markets, such as the buying and selling of GHG allowances or credits;

— regulatory/government GHG programmes, such as credit for early action, agreements or national and local reporting initiatives.

This document details principles and requirements for designing, developing, managing and reporting organization-level GHG inventories. It includes requirements for determining GHG emission and removal boundaries, quantifying an organization's GHG emissions and removals, and identifying specific company actions or activities aimed at improving GHG management. It also includes requirements and guidance on inventory quality management, reporting, internal auditing and the organization's responsibilities in verification activities.

ISO 14064-2 details principles and requirements for determining baselines, and monitoring, quantifying and reporting of project emissions. It focuses on GHG projects or project-based activities specifically designed to reduce GHG emissions and/or enhance GHG removals. It provides the basis for GHG projects to be verified and validated.

ISO 14064-3 details requirements for verifying GHG statements related to GHG inventories, GHG projects, and carbon footprints of products. It describes the process for verification or validation, including verification or validation planning, assessment procedures, and the evaluation of organizational, project and product GHG statements.

ISO 14065 defines requirements for bodies that validate and verify GHG statements. Its requirements cover impartiality, competence, communication, validation and verification processes, appeals, complaints and the management system of validation and verification bodies. It can be used as a basis for accreditation and other forms of recognition in relation to the impartiality, competence and consistency of validation and verification bodies.

ISO 14066 specifies competence requirements for validation teams and verification teams. It includes principles and specifies competence requirements based on the tasks that validation teams or verification teams have to be able to perform.

ISO 14067 defines the principles, requirements and guidelines for the quantification of the carbon footprint of products. The aim of ISO 14067 is to quantify GHG emissions associated with the life cycle stages of a product, beginning with resource extraction and raw material sourcing and extending through the production, use and end-of-life phases of the product.

ISO/TR 14069 assists users in the application of this document, providing guidelines and examples for improving transparency in the quantification of emissions and their reporting. It does not provide additional guidance to this document.

Figure 1 illustrates the relationship among the ISO 14060 family of GHG standards.

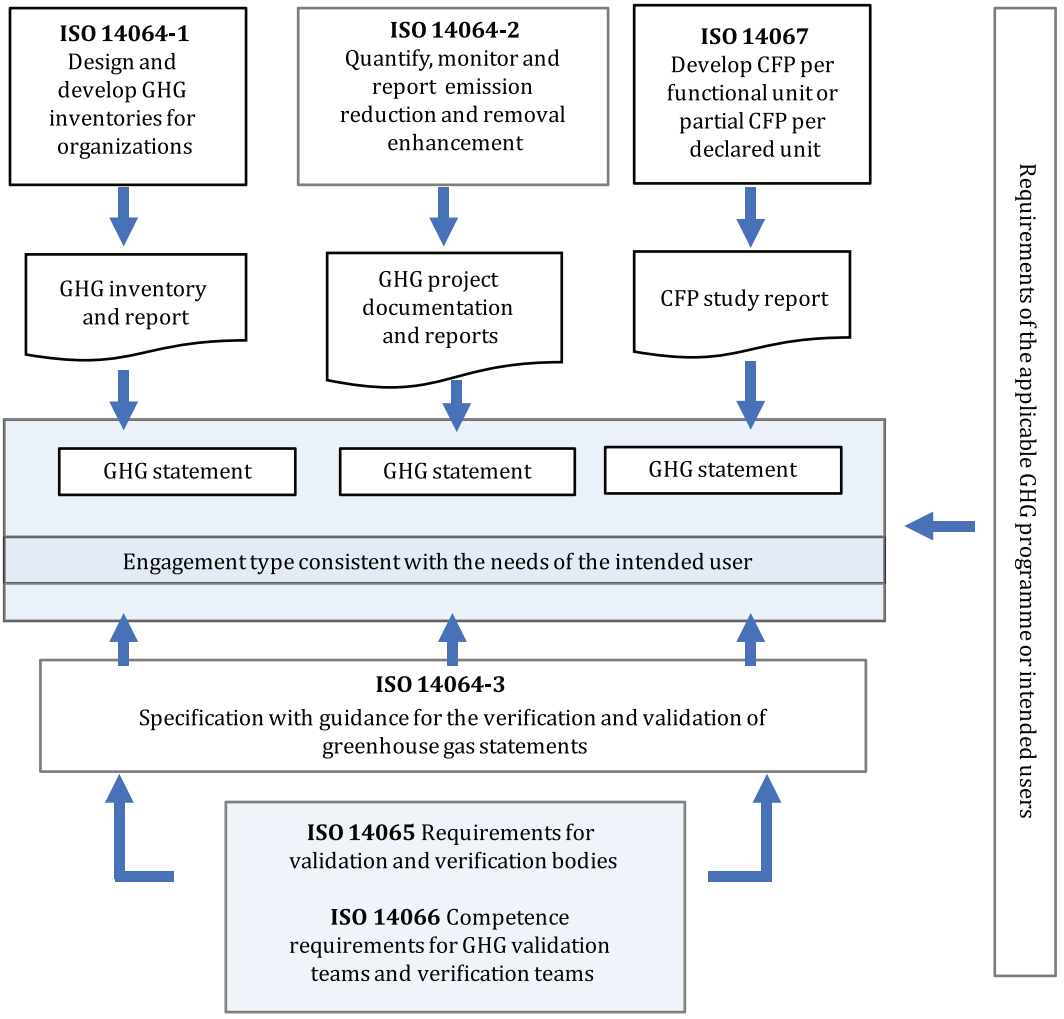


Figure 1 — Relationship among the ISO 14060 family of GHG standards

0.2 Base GHG quantification concepts used by this document

This document incorporates many key concepts developed over a number of years. References listed in the Bibliography provide (examples of) additional guidance on these concepts.

0.3 Significance of the terms "document", "explain" and "justify" in this document

Some clauses require users of this document to document, explain and justify the use of certain approaches or decisions taken.

Document involves capturing and storing the pertinent information in writing.

Explain involves two additional criteria:

a) describe how approaches were used or decisions taken, and

b) describe why approaches were chosen or decisions made.

Justify involves an additional third and fourth criteria:

c) explain why alternative approaches were not chosen, and

d) provide supporting data or analysis.

Greenhouse gases —

Part 1:
Specification with guidance at the organization level for quantification and reporting of greenhouse gas emissions and removals

1 Scope

This document specifies principles and requirements at the organization level for the quantification and reporting of greenhouse gas (GHG) emissions and removals. It includes requirements for the design, development, management, reporting and verification of an organization's GHG inventory.

The ISO 14064 series is GHG programme neutral. If a GHG programme is applicable, requirements of that GHG programme are additional to the requirements of the ISO 14064 series.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

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

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

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

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

3.1 Terms relating to greenhouse gases

3.1.1
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: For a list of GHGs, see the latest Intergovernmental Panel on Climate Change (IPCC) Assessment Report.

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

3.1.2
greenhouse gas source
GHG source
process that releases a *GHG* (3.1.1) into the atmosphere

3.1.3
greenhouse gas sink
GHG sink
process that removes a *GHG* (3.1.1) from the atmosphere

3.1.4
greenhouse gas reservoir
GHG reservoir
component, other than the atmosphere, that has the capacity to accumulate *GHGs* (3.1.1), and to store and release them

Note 1 to entry: Oceans, soils and forests are examples of components that can act as reservoirs.

Note 2 to entry: GHG capture and storage is one of the processes that results in a GHG reservoir.

3.1.5
greenhouse gas emission
GHG emission
release of a *GHG* (3.1.1) into the atmosphere

3.1.6
greenhouse gas removal
GHG removal
withdrawal of a *GHG* (3.1.1) from the atmosphere by *GHG sinks* (3.1.3)

3.1.7
greenhouse gas emission factor
GHG emission factor
coefficient relating *GHG activity data* (3.2.1) with the *GHG emission* (3.1.5)

Note 1 to entry: A GHG emission factor could include an oxidation component.

3.1.8
greenhouse gas removal factor
GHG removal factor
coefficient relating *GHG activity data* (3.2.1) with the *GHG removal* (3.1.6)

Note 1 to entry: A GHG removal factor could include an oxidation component.

3.1.9
direct greenhouse gas emission
direct GHG emission
GHG emission (3.1.5) from *GHG sources* (3.1.2) owned or controlled by the *organization* (3.4.2)

Note 1 to entry: This document uses the concepts of equity share or control (financial or operational control) to establish organizational boundaries.

3.1.10
direct greenhouse gas removal
direct GHG removal
GHG removal (3.1.6) from *GHG sinks* (3.1.3) owned or controlled by the *organization* (3.4.2)

3.1.11
indirect greenhouse gas emission
indirect GHG emission
GHG emission (3.1.5) that is a consequence of an *organization's* (3.4.2) operations and activities, but that arises from *GHG sources* (3.1.2) that are not owned or controlled by the organization

Note 1 to entry: These emissions occur generally in the upstream and/or downstream chain.

3.1.12
global warming potential
GWP
index, based on radiative properties of *GHGs* (3.1.1), measuring the radiative forcing following a pulse emission of a unit mass of a given GHG in the present-day atmosphere integrated over a chosen time horizon, relative to that of carbon dioxide (CO_2)

3.1.13
carbon dioxide equivalent
CO_2e
unit for comparing the radiative forcing of a *GHG* (3.1.1) to that of carbon dioxide

Note 1 to entry: The carbon dioxide equivalent is calculated using the mass of a given GHG multiplied by its *global warming potential* (3.1.12).

3.2 Terms relating to the GHG inventory process

3.2.1
greenhouse gas activity data
GHG activity data
quantitative measure of activity that results in a *GHG emission* (3.1.5) or *GHG removal* (3.1.6)

EXAMPLE Amount of energy, fuels or electricity consumed, material produced, service provided, area of land affected.

3.2.2
primary data
quantified value of a process or an activity obtained from a direct measurement or a calculation based on direct measurements

Note 1 to entry: Primary data can include *GHG emission factors* (3.1.7) *or GHG removal factors* (3.1.8) and/or *GHG activity data* (3.2.1).

3.2.3
site-specific data
primary data (3.2.2) obtained within the *organizational boundary* (3.4.7)

Note 1 to entry: All site-specific data are primary data, but not all primary data are site-specific data.

3.2.4
secondary data
data obtained from sources other than *primary data* (3.2.2)

Note 1 to entry: Such sources can include databases and published literature validated by competent authorities.

3.2.5
greenhouse gas statement
GHG statement
DEPRECATED: GHG assertion
factual and objective declaration that provides the subject matter for the *verification* (3.4.9) or *validation* (3.4.10)

Note 1 to entry: The GHG statement could be presented at a point in time or could cover a period of time.

Note 2 to entry: The GHG statement provided by the *responsible party* (3.4.3) should be clearly identifiable, capable of consistent evaluation or measurement against suitable criteria by a *verifier* (3.4.11) or *validator* (3.4.12).

Note 3 to entry: The GHG statement could be provided in a *GHG report* (3.2.9) or *GHG project* (3.2.7) plan.

3.2.6
greenhouse gas inventory
GHG inventory
list of *GHG sources* (3.1.2) and *GHG sinks* (3.1.3), and their quantified *GHG emissions* (3.1.5) and *GHG removals* (3.1.6)

3.2.7
greenhouse gas project
GHG project
activity or activities that alter the conditions of a GHG baseline and which cause *GHG emission* (3.1.5) reductions or *GHG removal* (3.1.6) enhancements

Note 1 to entry: ISO 14064-2 provides information on how to determine and use GHG baselines.

3.2.8
greenhouse gas programme
GHG programme
voluntary or mandatory international, national or subnational system or scheme that registers, accounts or manages *GHG emissions* (3.1.5), *GHG removals* (3.1.6), GHG emission reductions or GHG removal enhancements outside the *organization* (3.4.2) or *GHG project* (3.2.7)

3.2.9
greenhouse gas report
GHG report
standalone document intended to communicate an *organization's* (3.4.2) or *GHG project's* (3.2.7) GHG-related information to its *intended users* (3.4.4)

Note 1 to entry: A GHG report can include a *GHG statement* (3.2.5).

3.2.10
base year
specific, historical period identified for the purpose of comparing *GHG emissions* (3.1.5) or *GHG removals* (3.1.6) or other GHG-related information over time

3.2.11
greenhouse gas reduction initiative
GHG reduction initiative
specific activity or initiative, not organized as a *GHG project* (3.2.7), implemented by an *organization* (3.4.2) on a discrete or continuous basis, to reduce or prevent direct or indirect *GHG emissions* (3.1.5) or enhance direct or indirect *GHG removals* (3.1.6)

3.2.12
monitoring
continuous or periodic assessment of *GHG emissions* (3.1.5), *GHG removals* (3.1.6) or other GHG-related data

3.2.13
uncertainty
parameter associated with the result of quantification that 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.

3.2.14
significant indirect greenhouse gas emission
significant indirect GHG emission
organization's (3.4.2) quantified and reported *GHG emissions* (3.1.5) complying with the significance criteria set by the organization

3.3 Terms relating to biogenic material and land use

3.3.1
biomass
material of biological origin, excluding material embedded in geological formations and material transformed to fossilized material

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

3.3.2
biogenic carbon
carbon derived from *biomass* (3.3.1)

3.3.3
biogenic CO_2
CO_2 obtained by the oxidation of *biogenic carbon* (3.3.2)

3.3.4
anthropogenic biogenic GHG emission
GHG emission (3.1.5) from biogenic material as a result of human activities

3.3.5
direct land use change
dLUC
change in the human use of land within the relevant boundary

Note 1 to entry: Relevant boundary is the *reporting boundary* (3.4.8).

3.3.6
land use
human use or management of land within the relevant boundary

Note 1 to entry: Relevant boundary is the *reporting boundary* (3.4.8).

3.3.7
non-anthropogenic biogenic GHG emission
GHG emission (3.1.5) from biogenic material caused by natural disasters (e.g. wildfire or infestation by insects) or natural evolution (e.g. growth, decomposition)

3.4 Terms relating to organizations, interested parties and verification

3.4.1
facility
single installation, set of installations or production processes (stationary or mobile), which can be defined within a single geographical boundary, organizational unit or production process

3.4.2
organization
person or group of people that has its own functions with responsibilities, authorities and relationships to achieve its objectives

Note 1 to entry: The concept of organization includes, but is not limited to, sole-trader, company, corporation, firm, enterprise, authority, partnership, association, charity or institution, or part or combination thereof, whether incorporated or not, public or private.

3.4.3
responsible party
person or persons responsible for the provision of the *GHG statement* (3.2.5) and the supporting *GHG* (3.1.1) information

Note 1 to entry: The responsible party can be either individuals or representatives of an *organization* (3.4.2) or project, and can be the party who engages the *verifier* (3.4.11) or *validator* (3.4.12).

3.4.4
intended user
individual or *organization* (3.4.2) identified by those reporting GHG-related information as being the one who relies on that information to make decisions

Note 1 to entry: The intended user can be the *client* (3.4.5), the *responsible party* (3.4.3), the organization itself, *GHG programme* (3.2.8) administrators, regulators, the financial community or other affected interested parties, such as local communities, government departments, general public or non-governmental organizations.

3.4.5
client
organization (3.4.2) or person requesting *verification* (3.4.9) or *validation* (3.4.10)

3.4.6
intended use of the GHG inventory
main purpose set by the *organization* (3.4.2), or a programme, to quantify its *GHG emissions* (3.1.5) and *GHG removals* (3.1.6) consistent with the needs of the *intended user* (3.4.4)

3.4.7
organizational boundary
grouping of activities or facilities in which an *organization* (3.4.2) exercises operational or financial control or has an equity share

3.4.8
reporting boundary
grouping of *GHG emission* (3.1.5) or *GHG removals* (3.1.6) reported from within the *organizational boundary* (3.4.7), as well as those significant indirect emissions that are a consequence of the *organization's* (3.4.2) operations and activities

3.4.9
verification
process for evaluating a statement of historical data and information to determine if the statement is materially correct and conforms to criteria

3.4.10
validation
process for evaluating the reasonableness of the assumptions, limitations and methods that support a statement about the outcome of future activities

3.4.11
verifier
competent and impartial person with responsibility for performing and reporting on a *verification* (3.4.9)

3.4.12
validator
competent and impartial person with responsibility for performing and reporting on a *validation* (3.4.10)

3.4.13
level of assurance
degree of confidence in the *GHG statement* (3.2.5)

4 Principles

4.1 General

The application of principles is fundamental to ensure that GHG-related information is a true and fair account. The principles are the basis for, and will guide the application of, the requirements in this document.

4.2 Relevance

Select the GHG sources, GHG sinks, GHG reservoirs, data and methodologies appropriate to the needs of the intended user.

4.3 Completeness

Include all relevant GHG emissions and removals.

4.4 Consistency

Enable meaningful comparisons in GHG-related information.

4.5 Accuracy

Reduce bias and uncertainties as far as is practical.

4.6 Transparency

Disclose sufficient and appropriate GHG-related information to allow intended users to make decisions with reasonable confidence.

5 GHG inventory boundaries

5.1 Organizational boundaries

The organization shall define its organizational boundaries.

The organization may comprise one or more facilities. Facility-level GHG emissions or removals may be produced from one or more GHG sources or sinks.

The organization shall consolidate its facility-level GHG emissions and removals by one of the following approaches:

a) control: the organization accounts for all GHG emissions and/or removals from facilities over which it has financial or operational control;

b) equity share: the organization accounts for its portion of GHG emissions and/or removals from respective facilities.

The consolidation approach shall be consistent with the intended use of the GHG inventory.

NOTE 1 Guidance on applying control and equity share approaches to consolidate facility-level GHG emissions and removals to the organization level is included in Annex A.

The organization may use different consolidation approaches in the case of multiple reporting goals and requirements defined, for example, by the GHG programme, legal contract or different types of intended users.

NOTE 2 An organization's GHG emissions and removals are aggregated from facility-level quantification of GHG sources and sinks.

NOTE 3 A GHG sink in one period might become a GHG source in another period or vice versa.

When a facility is owned or controlled by several organizations, these organizations should adopt the same consolidation approach for that facility. The organization shall document and report which consolidation approach it applies.

5.2 Reporting boundaries

5.2.1 Establishing reporting boundaries

The organization shall establish and document its reporting boundaries, including the identification of direct and indirect GHG emissions and removals associated with the organization's operations.

5.2.2 Direct GHG emissions and removals

The organization shall quantify direct GHG emissions separately for CO_2, CH_4, N_2O, NF_3, SF_6 and other appropriate GHG groups (HFCs, PFCs, etc.) in tonnes of CO_2e.

The organization should quantify GHG removals.

5.2.3 Indirect GHG emissions

The organization shall apply and document a process to determine which indirect emissions to include in its GHG inventory.

As part of this process, the organization shall define and explain its own pre-determined criteria for significance of indirect emissions, considering the intended use of the GHG inventory.

Whatever the intended use is, criteria should not be used to exclude substantial quantities of indirect emissions or evade compliance obligations.

Using those criteria, the organization shall identify and evaluate its indirect GHG emissions, to select the significant ones.

The organization shall quantify and report these significant emissions. Exclusions of significant indirect emissions shall be justified.

The criteria to evaluate significance may include the magnitude/volume of the emissions, level of influence on sources/sinks, access to information and the level of accuracy of associated data (complexity of organization and monitoring). A risk assessment or other procedures (e.g. buyer requirements, regulatory requirements, concern of interested parties, scale of operation, etc.) may be used (see ISO 13065). More guidance is provided in Annex H.

The criteria for evaluating the significance may be periodically revised. The organization should retain documented information about the revisions.

5.2.4 GHG inventory categories

GHG emissions shall be aggregated into the following categories at the organizational level:

a) direct GHG emissions and removals;

b) indirect GHG emissions from imported energy;

c) indirect GHG emissions from transportation;

d) indirect GHG emissions from products used by organization;

e) indirect GHG emissions associated with the use of products from the organization;

f) indirect GHG emissions from other sources.

In each category, non-biogenic emissions, biogenic anthropogenic emissions and, if quantified and reported, biogenic non-anthropogenic emissions shall be separated (see Annex D).

The organization should document the above categories separately at the facility level.

GHG emissions should be further subdivided into subcategories consistent with the above categories. An example of subcategories is provided in Annex B.

6 Quantification of GHG emissions and removals

6.1 Identification of GHG sources and sinks

The organization shall identify and document all relevant GHG sources and sinks included in its reporting boundaries. The organization shall include all relevant GHGs.

GHG sources and sinks shall be identified in accordance with the categories defined in 5.2.4.

If the organization quantifies GHG removals, the organization shall identify and document GHG sinks contributing to its GHG removals.

The detail with which sources and sinks are identified and categorized shall be consistent with the quantification approach used.

The organization may exclude GHG sources or sinks for which the contribution to GHG emissions or removals is not relevant. It shall identify and explain why the GHG sources or sinks are excluded in accordance with the categories and any categorical subdivisions included in the report (see 5.2.3).

6.2 Selection of quantification approach

6.2.1 General

The organization shall select and use quantification methodologies that minimize uncertainty and yield accurate, consistent and reproducible results.

The quantification approach should also consider technical feasibility and cost.

NOTE Quantification approach is the process of obtaining data and determining the emissions or removals from a source or sink. GHG emissions or removals can be obtained through measurement or modelling.

The organization shall explain and document its quantification approach and any changes in quantification approach.

6.2.2 Data selection and collection used for quantification

The organization shall identify and document its data for each source or sink classified as direct or indirect emissions and removals. It shall determine and document the characteristics for each relevant data used for quantification (see 5.2.3).

NOTE 1 Data used for quantification include primary data (including site specific) and secondary data.

EXAMPLE Data used for quantification may include the average of truck fuel consumption and its characteristics as the standard to determine fuel consumption.

NOTE 2 In the case of GHG programmes, characteristics of data used for quantification are usually determined by the programme operator.

Annex C provides guidance on the selection and collection of data used for quantification.

6.2.3 Selection or development of GHG quantification model

Except in the case of measurement of emissions and removals, the organization shall select or develop models for the quantification approach.

A model is a representation of how the source or sink data used for quantification are converted into emissions or removals. A model is a simplification of physical processes that has assumptions and limitations.

The organization shall explain and document the justification for the selection or development of the model, considering the following model characteristics:

a) how the model accurately represents the emissions and removals;

b) its limits of application;

c) its uncertainty and rigour;

d) the reproducibility of results;

e) the acceptability of the model;

f) the origin and level of recognition of the model;

g) the consistency with the intended use.

NOTE Several types of models make use of activity data multiplied by emission factors.

6.3 Calculation of GHG emissions and removals

The organization shall calculate GHG emissions and removals in accordance with the quantification approach selected (see 6.2).

The period for which GHG emissions and removals have been calculated shall be reported.

The organization shall convert the quantity of each type of GHG to tonnes of CO_2e using appropriate GWPs.

The latest IPCC's GWP should be used. If not, justification shall be provided. The GWP time horizon shall be 100 years. Other GWP time horizons may be used, but reported separately.

NOTE GWP might be part of a model (including emissions factors).

The organization shall quantify biogenic emissions or removals in accordance with Annex D.

The organization shall quantify emissions or removals from imported electricity that is consumed by the organization, and of exported electricity generated by the organization, in accordance with Annex E.

Specific guidance concerning emissions or removals from agriculture is provided in Annex G.

6.4 Base-year GHG inventory

6.4.1 Selection and establishment of base year

The organization shall establish a historical base year for GHG emissions and removals for comparative purposes or to meet GHG programme requirements or other intended uses of the GHG inventory.

Base-year emissions or removals may be quantified based on a specific period (e.g. a year or part of a year where seasonality is a feature of the organization's activity) or averaged from several periods (e.g. several years).

If sufficient information on historical GHG emissions or removals is not available, the organization may use its first GHG inventory period as the base year.

In establishing the base year, the organization:

a) shall quantify base-year GHG emissions and removals using data representative of the organization's current reporting boundary, typically single-year data, a consecutive multi-year average or a rolling average;

b) shall select a base year for which verifiable GHG emissions or removals data are available;

c) shall explain the selection of the base year;

d) shall develop a GHG inventory for the base year consistent with the provisions of this document.

The organization may change its base year, but shall justify any change to the base year.

6.4.2 Review of base-year GHG inventory

To ensure the representativeness of the base-year GHG inventory, the organization shall develop, document and apply a base-year review and recalculation procedure to account for substantial cumulative changes in base-year emissions resulting from:

a) a structural change in reporting or organizational boundaries (i.e. merger, acquisition or divestiture), or

b) a change in calculation methodologies or emission factors, or

c) the discovery of an error or a number of cumulative errors that are collectively substantial.

The organization shall not recalculate its base-year GHG inventory to account for changes in facility production levels, including the closing or opening of facilities.

The organization shall document base-year recalculations in subsequent GHG inventories.

7 Mitigation activities

7.1 GHG emission reduction and removal enhancement initiatives

The organization may plan and implement GHG reduction initiatives to reduce or prevent GHG emissions or enhance GHG removals.

If implemented, the organization should quantify GHG emission or removal differences attributable to the implementation of GHG reduction initiatives.

NOTE GHG emission or removal differences resulting from GHG reduction initiatives are usually reflected in the organization's GHG inventory, but can also result in GHG emission or removal differences outside GHG inventory boundaries.

If quantified and reported, the organization shall document GHG reduction initiatives and associated GHG emission or removal differences separately, and shall describe:

a) the GHG reduction initiatives;

b) the spatial and temporal boundaries of the GHG reduction initiatives;

c) the approach (appropriate indicators) used to quantify GHG emission or removal differences;

d) the determination and classification of GHG emission or removal differences attributable to GHG reduction initiatives as direct or indirect GHG emissions or removals.

EXAMPLE GHG reduction initiatives might include the following:

— energy demand and use management;

— energy efficiency;

— technology or process improvements;

— GHG capture and storage in, typically, a GHG reservoir;

— management of transport and travel demands;

— fuel switching or substitution;

— afforestation;

— waste minimization;

— alternative fuels and raw materials (AFR) use to avoid landfilling or incinerating the wastes;

— refrigerant management.

7.2 GHG emission reduction or removal enhancement projects

If the organization reports offsets purchased or developed, the organization shall list such offsets separately from GHG reduction initiatives.

7.3 GHG emission reduction or removal enhancement targets

The organization may set targets to reduce GHG emissions.

If the organization reports a target, the following information shall be specified and reported:

— period covered by the target, including the target reference year and the target completion year;

— type of target (intensity or absolute);

— category of emissions included in the target;

— the amount of reduction and its unit expressed in accordance with the type of target.

For setting the target, the following criteria should be considered:

— climate science;

— reduction potential;

— international, national context;

— sectorial context (e.g. voluntary sectorial commitment, cross-sectorial effect).

8 GHG inventory quality management

8.1 GHG information management

8.1.1 The organization shall establish and maintain GHG information management procedures that:

a) ensure conformity with the principles of this document;

b) ensure consistency with the intended use of the GHG inventory;

c) provide routine and consistent checks to ensure accuracy and completeness of the GHG inventory;

d) identify and address errors and omissions;

e) document and archive relevant GHG inventory records, including information management activities and GWPs.

8.1.2 The organization's GHG information management procedures shall document their consideration of the following:

a) identification and review of the responsibility and authority of those responsible for GHG inventory development;

b) identification, implementation and review of appropriate training for members of the inventory development team;

c) identification and review of organizational boundaries;

d) identification and review of GHG sources and sinks;

e) selection and review of quantification approaches, including data used for quantification and GHG quantification models that are consistent with the intended use of the GHG inventory;

f) review of the application of quantification approaches to ensure consistency across multiple facilities;

g) use, maintenance and calibration of measurement equipment (if applicable);

h) development and maintenance of a robust data-collection system;

i) regular accuracy checks;

j) periodic internal audits and technical reviews;

k) periodic review of opportunities to improve information management processes.

8.2 Document retention and record keeping

The organization shall establish and maintain procedures for document retention and record keeping.

The organization shall retain and maintain documentation supporting the design, development and maintenance of the GHG inventory to enable verification. The documentation, whether in paper, electronic or other format, shall be handled in accordance with the organization's GHG information management procedures for document retention and record keeping.

8.3 Assessing uncertainty

The organization shall assess the uncertainty associated with the quantification approaches (e.g. data used for quantification and models) and conduct an assessment that determines the uncertainty at the GHG inventory category level.

Where quantitative estimation of uncertainty is not possible or cost effective, it shall be justified and a qualitative assessment shall be conducted.

The organization may apply the principles and methodologies of ISO/IEC Guide 98-3 in completing the uncertainty assessment.

9 GHG reporting

9.1 General

The organization should prepare a GHG report, consistent with the intended uses of the GHG inventory, to facilitate GHG inventory verification. For example, a GHG report may be necessary for participation in a GHG programme or to inform external or internal users.

A GHG report shall be prepared if the organization chooses to have its GHG inventory verified or makes a public GHG statement claiming conformity with this document.

GHG reports shall be complete, consistent, accurate, relevant, transparent and planned in accordance with 9.2.

If the organization's GHG statement has been independently (third-party) verified, the verification statement shall be made available to intended users.

If confidential data are withheld from inclusion in a GHG report, this shall be justified.

If the organization decides to prepare a GHG report, 9.2 and 9.3 apply.

9.2 Planning the GHG report

The organization shall explain and document the following in planning its GHG report:

a) purpose and objectives of the report in the context of the organization's GHG policies, strategies or programmes, and applicable GHG programmes;

b) intended use and intended users of the GHG inventory;

c) overall and specific responsibilities for preparing and producing the report;

d) frequency of the report;

e) report structure and format;

f) data and information to be included in the report;

g) policy on availability and methods of dissemination of the report.

9.3 GHG report content

9.3.1 Required information

The organization's GHG report shall describe the organization's GHG inventory. Its content may be structured as recommended in Annex F.

GHG report content shall include the following:

a) description of the reporting organization;

b) person or entity responsible for the report;

c) reporting period covered;

d) documentation of organizational boundaries (5.1);

e) documentation of reporting boundaries, including criteria determined by the organization to define significant emissions;

f) direct GHG emissions, quantified separately for CO_2, CH_4, N_2O, NF_3, SF_6 and other appropriate GHG groups (HFCs, PFCs, etc.) in tonnes of CO_2e (5.2.2);

g) a description of how biogenic CO_2 emissions and removals are treated in the GHG inventory and the relevant biogenic CO_2 emissions and removals quantified separately in tonnes of CO_2e (see Annex D);

h) if quantified, direct GHG removals, in tonnes of CO_2e (5.2.2);

i) explanation of the exclusion of any significant GHG sources or sinks from the quantification (5.2.3);

j) quantified indirect GHG emissions separated by category in tonnes of CO_2e (5.2.4);

k) the historical base year selected and the base-year GHG inventory (6.4.1);

l) explanation of any change to the base year or other historical GHG data or categorization and any recalculation of the base year or other historical GHG inventory (6.4.1), and documentation of any limitations to comparability resulting from such recalculation;

m) reference to, or description of, quantification approaches, including reasons for their selection (6.2);

n) explanation of any change to quantification approaches previously used (6.2);

o) reference to, or documentation of, GHG emission or removal factors used (6.2);

p) description of the impact of uncertainties on the accuracy of the GHG emissions and removals data per category (8.3);

q) uncertainty assessment description and results (8.3);

r) a statement that the GHG report has been prepared in accordance with this document;

s) a disclosure describing whether the GHG inventory, report or statement has been verified, including the type of verification and level of assurance achieved;

t) the GWP values used in the calculation, as well as their source. If the GWP values are not taken from the latest IPCC report, include the emissions factors or the database reference used in the calculation, as well as their source.

9.3.2 Recommended information

The organization should consider including in the GHG report:

a) description of the organization's GHG policies, strategies or programmes;

b) if appropriate, description of GHG reduction initiatives and how they contribute to GHG emission or removal differences, including those occurring outside organizational boundaries, quantified in tonnes of CO_2e (7.1);

c) if appropriate, purchased or developed GHG emission reductions and removal enhancements from GHG emission reduction and removal enhancement projects, quantified in tonnes of CO_2e (7.2);

d) as appropriate, description of applicable GHG programme requirements;

e) GHG emissions or removals disaggregated by the facility;

f) total quantified indirect GHG emissions;

g) description and presentation of additional indicators, such as efficiency or GHG emission intensity (emissions per unit of production) ratios;

h) assessment of performance against appropriate internal and/or external benchmarks;

i) description of GHG information management and monitoring procedures (8.1);

j) GHG emissions and removals from the previous reporting period;

k) if appropriate, explanation of GHG emissions differences between the present inventory and the previous one.

The organization may aggregate direct emissions and direct removals.

9.3.3 Optional information and associated requirements

The organization may report optional information separately from the required information and the recommended information. Each type of optional information described below should be reported separately from the others.

The organization may report the results of contractual instruments for GHG attributes (market based approach), expressed in GHG emissions (tCO_2e) as well as in the unit of transfer (e.g. kWh). The organization may report the amount purchased compared to the amount consumed.

The organization may report offsets or other types of carbon credits. If so, the organization:

— shall disclose the GHG scheme under which they were generated;

— may add offsets or other types of carbon credits together if they originate from the same GHG scheme and are of appropriate vintage;

— shall not add or subtract offsets or other types of carbon credits from the organization's inventory of its direct or indirect emissions.

The organization may report GHGs stored in GHG reservoirs.

10 Organization's role in verification activities

The organization may decide to conduct a verification.

To review GHG emissions and removals information, impartially and objectively, the organization shall conduct a verification consistent with the needs of the intended user. Principles and requirements are described in ISO 14064-3.

Requirements for verification bodies are described in ISO 14065.

Requirements for the competence of validation teams and verification teams are described in ISO 14066.

Annex A
(informative)

Process to consolidate data

A.1 General

Organizations are encouraged to refer to ISO/TR 14069 for additional guidance in applying consolidation approaches and dealing with double counting.

An organization engaged in setting its organizational boundaries should first define the intended uses of its GHG inventory by considering its GHG policies, strategies or programmes, operations and facilities to determine the GHG sources which it can control and those which it may influence.

The intended use of the inventory can help to determine the organizational boundaries (see H.1). In developing its GHG quantification and reporting system, an organization should ensure that the data system can meet a range of reporting requirements. GHG data should be recorded and quantified by source, sink and type, at least to the facility level. Such data should be retained in its disaggregated form to provide maximum flexibility in meeting a range of reporting requirements. Consolidation of the information can then be carried out as required.

If the GHG emissions and removals are quantified at the facility level, and according to the intended use of the GHG inventory, one of the two approaches outlined in A.2 and A.3 should be selected to guide and assist in the consolidation of facility data to the organization level.

Where possible, organizations should follow the organizational boundaries already in place for their financial accounting, provided these are explicitly explained and followed consistently. When applying these concepts, the underlying assumption of "substance over form" should be followed. That is, GHG emissions and removals should be quantified and reported in accordance with the organization's substance and economic reality and not merely its legal form.

A.2 Consolidation based on control

Under the control approach, an organization accounts for 100 % of the GHG emissions or removals from operations over which it has control. It does not account for GHG emissions or removals from operations in which it owns an interest but has no control. Control may be defined in either financial or operational terms. When using the control approach to consolidate GHG emissions or removals, organizations may choose between either the operational control or financial control criteria.

An organization has financial control over the operation if it has the ability to direct the financial and operating policies of the operation with a view to gaining economic benefits from its activities. An organization has operational control over an operation if it, or one of its subsidiaries, has the full authority to introduce and implement its operating policies at the operational level.

A.3 Consolidation based on equity share

Equity share is the percentage of economic interest in, or benefit derived from, a facility. This consolidation approach increases the usability of GHG information for different users, and aims to mirror as far as possible the approach adopted by financial accounting and reporting standards. The equity share approach can be particularly useful for multinational companies with operations in a number of different jurisdictions aiming to determine their GHG inventory.

Consolidating to the organizational level based on equity share requires establishing the ownership percentage of each facility, and accounting for that percentage of GHG emissions or removals from respective facilities, including using production share agreements.

Annex B
(informative)

Direct and indirect GHG emissions categorization

B.1 General

GHG emissions are aggregated to assist in identifying sources and providing consistency in reporting GHG inventories.

Each category may be further subdivided, depending on the intended user or other factors.

B.2 Category 1: Direct GHG emissions and removals

B.2.1 Summary

Direct GHG emissions and removals occur from GHG sources or sinks inside organizational boundaries and that are owned or controlled by the organization. Those sources can be stationary (e.g. heaters, electricity generators, industrial process) or mobile (e.g. vehicles).

B.2.2 Examples of subcategorization and identification of associated sources and sinks

a) Direct emissions from stationary combustion, which are the consequence of combustion of any type of fuel (fossil or biomass) burnt in stationary (fixed) equipment, such as heaters, gas turbines, boilers. This could be done to generate heat, mechanical work and steam.

b) Direct emissions from mobile combustion, which are the consequence of fuel burnt in transport equipment, such as motor vehicles, trucks, ships, aircraft, locomotives fork lift trucks.

   Emissions from journeys in vehicles not included within the organizational boundaries should be reported as "indirect emissions" arising from business travel, employee commuting, client or visitors transport, upstream leased assets, etc.

c) Direct process emissions and removals from industrial processes.

   NOTE 1 Examples of industrial processes that result in direct process emissions include, but are not limited to, cement and lime production, chemical production, manufacturing, oil and gas refining, and non-combustion processes involving the avoidance, replacement, destruction, decomposition or mitigation of industrial GHG emissions (e.g. N_2O) and purification processes associated with carbon capture and storage (e.g. amine solution capture systems).

d) Direct fugitive emissions from the release of GHGs in anthropogenic systems.

   NOTE 2 Direct fugitive emissions can come from systems that extract, process, store, and deliver fossil fuels (e.g. flanges, valves, unions and threaded connections); from equipment leaks (e.g. cooling systems); from agricultural processes (e.g. putrefaction and fermentation, manure, livestock, application of nitrogen fertilizers); and from uncontrolled decomposition of waste material from such sources as landfills, composting facilities, waste water treatment, and other waste management processes.

   NOTE 3 Emissions from flaring or venting are quantified as "direct emissions". Emissions from flaring and venting could be unintentional or intentional. Examples include: designed releases of CH_4 or CO_2 containing natural gas or hydrocarbon gas (not including stationary combustion flue gas) to the atmosphere through seals or vent pipes; equipment blowdown for maintenance; and direct venting of gas used to power equipment (such as pneumatic devices).

NOTE 4 Intentional reversals of carbon removals, such as back burning to prevent future forest fires, are quantified as anthropogenic biogenic emissions (negative removal) and reported in accordance with Annex D.

e) Direct emissions and removals from land use, land use change and forestry (LULUCF), which covers all GHGs, from living biomass to organic matter in soils. According to IPCC guidelines[15], emissions can be assessed in six main land-use categories (forest land, cropland, grassland, wetland, settlement, other land) and several carbon reservoirs (living above-ground biomass, living underground biomass, deadwood, leaf litter, soil organic matter). A change in carbon stock can occur when land use change from one category to another (e.g. converting forest to crop land) or within a land use category (e.g. converting a natural forest to a managed forest, converting from till to no-till). Removals occur when there is an increase of carbon stock in the reservoirs. Emissions occur when there is a decrease and when N_2O is emitted.

   Options for quantification methodologies: CO_2e emissions associated with LULUCF occur after actions have been undertaken which generate differences in carbon stocks. The period of time after this action is generally set as 20 years. Thus, organizations may quantify either all emissions associated with the action (total carbon stock differences) or annual emissions (1/20 of total carbon stocks differences). If the second option is chosen, emissions should be reported "each time" during a 20-year period.

   NOTE 5 With respect to GHG emissions and removals connected to marine areas, only very limited information is available.

B.3 Category 2: Indirect GHG emissions from imported energy

B.3.1 Summary

This category includes only GHG emissions due to the fuel combustion associated with the production of final energy and utilities, such as electricity, heat, steam, cooling and compressed air. It excludes all upstream emissions (from cradle to power plant gate) associated with fuel, emissions due to the construction of the power plant, and emissions allocated to transport and distribution losses.

NOTE Annex E describes requirements for the treatment of imported and exported electricity.

B.3.2 Examples of subcategorization and identification of associated sources and sinks

a) Indirect emissions from imported electricity, including GHG emissions related to the production and consumption of electricity imported by the organization.

b) Indirect emissions from imported energy, including GHG emissions related to the production of energy consumed by the organization through a physical network (steam, heating, cooling and compressed air), excluding electricity.

B.4 Category 3: Indirect GHG emissions from transportation

B.4.1 Summary

GHG emissions occur from sources located outside the organizational boundaries. Those sources are mobile and are mostly due to fuel burnt in transport equipment. If relevant, the category also includes emissions associated with:

— refrigeration gas leaks (e.g. chilled transport, air conditioner);

— upstream emissions arising from fuel generation and fuel transportation/distribution;

— construction of the transport equipment (vehicle and infrastructure).

This category includes transport for persons and goods, and for all modes (rail, maritime, air and road). If transport equipment is owned or controlled by the organization, the emissions shall be taken into account in category 1 (B.2) as direct emissions.

Options for quantification methodologies: According to the consolidation approach chosen by the organization, emissions from leased vehicles could be reported either in this category or in the category for indirect GHG emissions from services used by an organization (B.5.3).

EXAMPLE When the reporting organization is leasing the fleet (as the lessee):

— if financial control approach is chosen, then fleet emissions are reported as indirect;

— if operational control approach is chosen, then fleet emissions are reported as direct.

In respect to which option is chosen, attention should be paid to omission or double counting issues.

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[15].

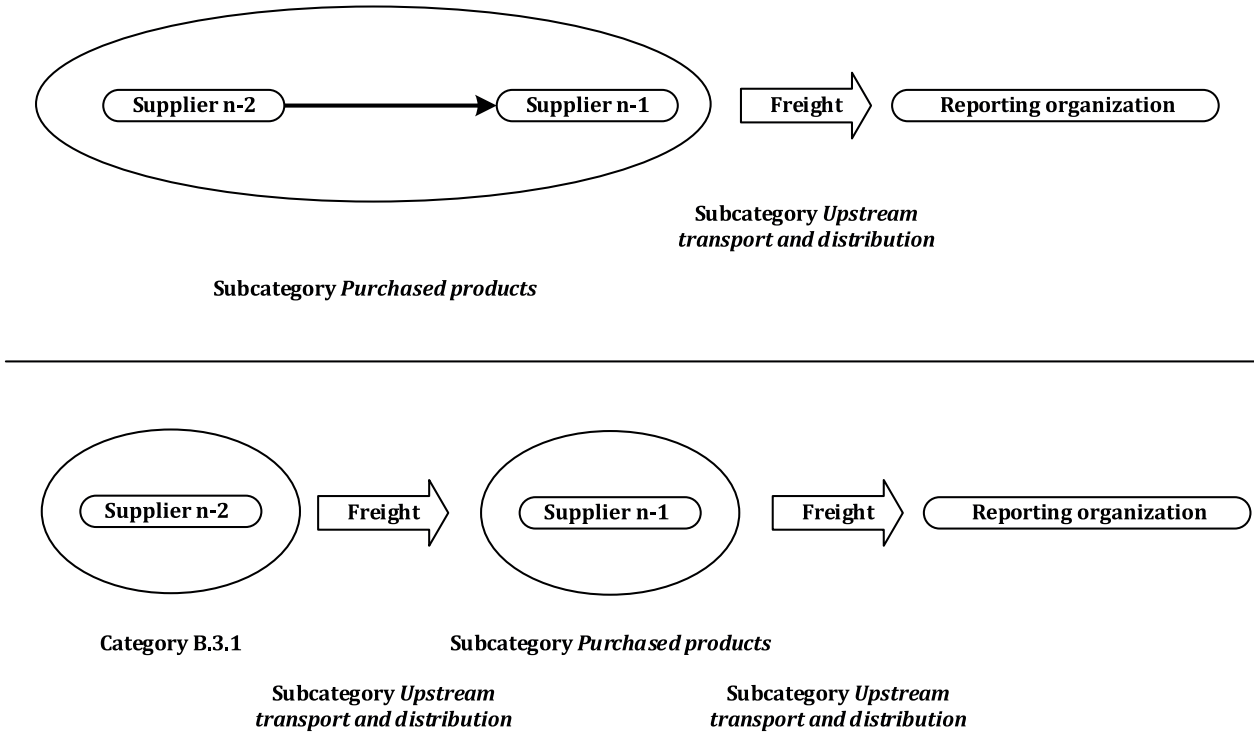
B.4.2 Examples of subcategorization and identification of associated sources and sinks

a) Emissions from upstream transport and distribution for goods, which are emissions from freight services that are paid for by the organization.

   Options for quantification methodologies: Missions could include either the latest transport activity from the supplier to the organization, or all transport activities throughout the supply chain.

   In respect to which option is chosen, attention should be paid to the interaction with the category for indirect GHG emissions from products used by an organization (B.5) (namely omission or double counting issues).

   Figure B.1 illustrates the example of a double counting issue between categories.



NOTE Adapted from ISO/TR 14069:2013, Figure 3.

Figure B.1 — Example of double counting issue between categories

b) Emissions from downstream transport and distribution for goods are emissions from freight services that are due to the first purchasers or other purchasers throughout the supply chain but not paid for by the organization.

   As for upstream transport and distribution for goods, the same options for quantification methodologies apply.

c) Emissions from employee commuting, including emissions related to the transportation of employees from their homes to their workplaces. Telecommuting may incur a greater use of energy for heating or cooling from part of the employee's energy consumption at home and thus could be considered in this subcategory.

d) Emissions from client and visitor transport, including emissions associated with the travel of clients and visitors to the reporting company's facility.

e) Emissions from business travel mainly due to fuel burnt in mobile sources of combustion. Hotel nights might be included when linked to the business travel, i.e. a stay over for flight connections, when attending a conference or for other business purposes. The indirect emissions generated during the journey should also be included, if such data are available and significant.

B.5 Category 4: Indirect GHG emissions from products used by an organization

B.5.1 Indirect GHG emissions from goods purchased by an organization — Summary

GHG emissions occur from sources located outside the organizational boundaries associated with goods used by the organization. Those sources might be stationary or mobile and are associated with all types of goods purchased by the reporting organization. Emissions are mostly due to the following phase in a "cradle to supplier output gate" approach:

— extraction of raw materials, agricultural activities;

— transportation of raw materials/products between suppliers;

— manufacturing and processing of raw materials.

Attention should be paid to not double count with other categories/subcategories, such as indirect GHG emissions from transportation and services purchased by the organization.

B.5.2 Examples of subcategorization and identification of associated sources and sinks

a) Emissions from purchased goods, which are emissions associated with the fabrication of the product. As this could encompass a wide range of products, further subcategorization may be defined by the intended user. For example, subcategorization may distinguish products by type of materials (steel, plastic, glass, electronic, etc.) or by function in the value chain (production related product versus non-production related product). This subcategory includes emissions associated with the production of energy purchased (i.e. upstream emissions associated with oil and electricity production) that are not otherwise included in category for indirect GHG emissions from energy (B.3).

b) Emissions from capital goods are emissions from goods that are purchased and amortized by the organization. This includes goods used by the organization to manufacture a product, provide a service, or sell, store and deliver merchandise. Generally, capital goods have an extended lifetime and are neither transformed nor sold to another organization or to consumers. This subcategory includes all upstream emissions from the production of capital goods purchased or acquired by the reporting organization.

   Examples of capital goods include equipment, machinery, buildings, facilities and vehicles. In financial accounting, capital equipment is treated as fixed assets or plant, property and equipment.

Options for quantification methodologies: Emissions within this subcategory could include either the total of emissions associated with the production of the capital good or an amortized part of the total (based on accounting rules or life time duration). If the second option is chosen, emissions should be reported pro-rata during the amortization period.

When CO_2 is stored as carbon in goods for a specified time, this carbon storage should be treated according to the methodology defined in ISO 14067.

B.5.3 Indirect GHG emissions from services used by organization — Summary

Indirect GHG emissions from services used by the organization occur from sources located outside the organizational boundaries. Those emissions might cover a very wide range of services and associated process. Emissions should be calculated in a "cradle to supplier output gate" approach.

Subcategorization may be used by the intended user to differentiate and quantify emissions linked to different types of services used by an organization as described in the examples below.

B.5.4 Examples of subcategorization and identification of associated sources and sinks

a) Emissions from the disposal of solid and liquid waste depend upon the characteristics of waste and its treatment. The typical type of treatment is landfill, incineration, biological treatment or recycling process. The principal emissions are CO_2 and CH_4 and an associated emission is N_2O, which occurs in incineration or biological treatment.

   Options for quantification methodologies: Emissions from waste transportation (from organization to disposal facility) could be quantified either in this category or in the category for indirect GHG emissions from transportation (B.4). In respect to which option is chosen, attention should be paid to omission or double counting issues.

b) Emissions from the use of assets are generated through equipment leased by the reporting organization in the reporting year. This subcategory is only applicable to an organization that operates leased assets (i.e. lessees). Leases depend on the nature of item leased, length of the lease, financial and contractual arrangements. Three main types of leasing could be identified as: finance leasing, operating leasing and contract hire. The organization should pay attention to ensure there is not double counting with direct emissions (e.g. vehicle fleet).

   An organization using the operational control method of consolidation may quantify these emissions as direct emissions.

   NOTE An example is provided in B.2.2.

c) Emissions from the use of services that are not described in the above subcategories include consulting, cleaning, maintenance, mail delivery, bank, etc.

B.6 Category 5: Indirect GHG emissions associated with the use of products from the organization

B.6.1 Summary

GHG emissions or removals associated with the use of products from the organization result from products sold by the organization during life stages occurring after the organization's production process. Those emissions or removals might cover a very wide range of services and associated processes.

In most cases, the organization does not know the product's exact destiny through its life stages and, thus, should define plausible scenarios for each life stage.

The scenarios should be clearly explained in the report.

B.6.2 Examples of subcategorization and identification of associated sources and sinks

a) Emissions or removals from the use stage of the product include the total expected lifetime emissions from all relevant products sold. The emissions from this subcategory are very closely linked to the life stage scenarios. From a general point of view, the more the product is a final product, the easier it is to define scenarios. For example, it is easier for a motor vehicle manufacturer to define vehicle use scenarios (in order to evaluate motor vehicle energy consumption) than for a steel supplier who has a bigger range of application scenarios for its products.

   NOTE Guidance is provided in ISO/TR 14069.

b) Emissions from downstream leased assets include those from the operation of assets that are owned by the reporting organization and leased to other entities during the reporting year. This subcategory is applicable to the lessors (i.e. an organization that receives payments from lessees).

c) Emissions from end of life stage of the product include the emissions associated with the end of life of all products sold by the reporting organization in the reporting year. Generally, the emissions sources and sinks are those concerned with disposal of solid and liquid waste (B.4.1). However, for the use stage of the product (B.5.1), the organization should define “end of life scenarios”. Consequently, the emissions from this subcategory are closely linked to these scenarios.

d) Emissions from investments are mainly targeting private or public financial institutions. Emissions could result from four types of operations: equity debt, investment debt, project finance and others.

B.7 Category 6: Indirect GHG emissions from other sources

The purpose of this category is to capture any organization specific emission (or removal) that cannot be reported in any other category. In consequence, it is the organization’s responsibility to define the content of this particular category.

Annex C
(informative)

Guidance on the selection, collection and use of data for GHG quantification approach for direct emissions

C.1 General

According to the requirements in Clause 6, this annex describes several approaches focusing on how to quantify direct emissions (see Figure C.1). Examples are provided to illustrate a wide range of practices usually implemented by organizations.

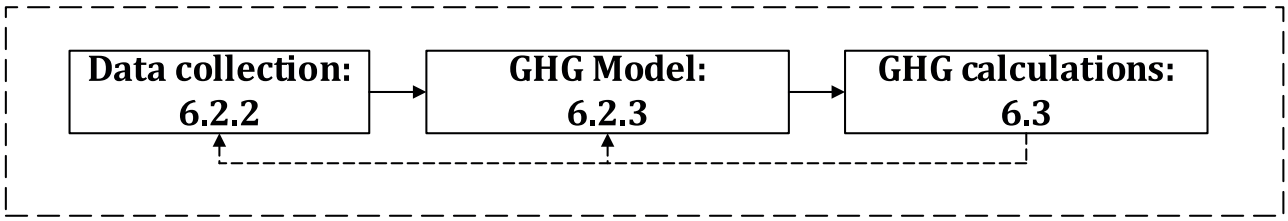


Figure C.1 — Quantification approach steps

C.2 Guidance on the selection of quantification approach

See 6.2. A quantification approach is a process of obtaining data and determining emissions from sources or removals by sinks. GHG emissions or removals may be determined through measurement or modelling. This is represented, at a very high level, in Figure C.1. The quantification approach is source/sink specific and an organization's inventory might contain different quantification approaches.

There is interdependency between the different steps of a specific quantification approach. The quantification approach will vary with the quantification model of the GHG, which influences how the organization might have to select, collect and use different types of data in order to quantify its GHG emissions. Likewise, depending on whether the final calculations of the GHG meet certain conditions related to accuracy, reproducibility, etc., the organization might have to change the quantification models and data collection of the GHG (see also ISO 14033). The calculation of GHG emissions or removals is the step of putting together data and models in the appropriate way, performing the calculations and aggregating the output results for the GHG emitted by the given sources and sinks.

Quantification models for direct emissions can include mass balance, intermittent emission measurements, estimations and standard approach.

Quantification with measurement approach can include continuous emissions monitoring systems (CEMS) and predictive emissions monitoring systems (PEMS).

NOTE Concerning direct emissions models, such as monitoring or measurements, the model is, by construction, incorporated in the design and operating of measurement technical devices.

Data can be classified as primary or secondary data (depending on who has originally collected it) and site-specific or not site-specific (depending on if it has been obtained from the original source or sink). The type of data that needs to be collected depends on the specific GHG's model, which depends on requirements such as the final admissible uncertainty, data availability, costs, pre-existence of other

data or other reasons. The type of data that is generally used as input to different quantification methods includes, but is not limited to:

a) activity data, such as mass, volume, energy or monetary value;

b) calorific values: net or gross, often used as input for higher accuracy combustion and primary and site-specific activity data calculations;

c) emission factor, usually expressed as tCO_2e/quantity of activity data;

d) composition data, usually expressed as carbon content, often used for higher accuracy and primary and site-specific emission factor calculations;

e) oxidation factors;

f) conversion factors;

g) emissions, usually on a mass basis per a reference period (e.g. hourly);

h) monetary values, usually amounts spent on certain products, materials or services.

Often some of these data are embedded within model assumptions. Sometimes data have to be collected on site as primary data. This will depend on the admissible uncertainty requirements, which might be reflected in different tiers of application of the model (see Box 1 for an example).

Box 1 — Illustrative examples

Combustion is the most common process that leads to direct CO_2 emissions. Nevertheless, quantification approaches for combustion emissions can range from the very simple to the very complex. This is often reflected in tier systems, which typify some of the key choices that an organization can make in deciding its quantification approach. Below is an example of two different tiers, one simple and the other complex.

Simple tier: The activity data (volume of fuel) is collected from receipts of fuel supply. From these, the total volumes for a year are calculated by adding them. The emission factor of fuel is taken from IPCC default values. No consideration is taken for unburnt quantities of carbon or for the emission of other gases (e.g. CH_4). The emissions result from the multiplication of the annual fuel volume taken from the receipts times the default emission factor.

Complex tier: The volume flow of natural gas is continuously monitored through two parallel measurement lines equipped with a turbine gas meter coupled with temperature and pressure readings and an electronic device converting measurements to gas volume (Nm_3), with an overall uncertainty < 1,5 %. The emission factor is determined using a gas chromatograph designed to separate and identify the components in natural gas samples. The system takes four to eight samples per hour and conforms with ISO 10715. Hourly and daily emission factors (on a tCO_2/net calorific value) are calculated based on the measured % composition of CH_4 and ten other gases present in the flow. The entire measurement system self-calibrates on a daily basis and is subject to regular monthly calibration checks. All calibration gases are certified to ISO/IEC 17025 and the operation of the gas chromatograph is performed by an entity that is ISO 9001 certified. Additionally, there is an annual validation of the gas chromatograph in accordance with ISO 10723 by an ISO/IEC 17025 accredited laboratory.

To determine the relevance of sources, an organization should consider each of the principles found in Clause 4. Affirmative answers to the following questions should indicate that a GHG source is relevant.

— Relevance: Does the source/sink need to be quantified and reported in order to meet the needs of the intended user(s) either on its own or in combination with other sources?

— Completeness: Does the source/sink need to be included in the inventory for the inventory to include all relevant sources?

— Consistency: Would a user be unable to make meaningful comparisons of GHG-related information within the inventory or against GHG inventories of similar organizations following current GHG accounting and reporting practices if the source/sink was excluded?

— Accuracy: Is the source/sink, on its own or in combination with other sources, necessary for the inventory totals to be reasonably free from uncertainty?

— Transparency: Would the exclusion of a source or sink or multiple sources and sinks, without disclosure and justification, impede intended users from making decisions with reasonable confidence? Is the disclosed GHG-related information sufficient and appropriate to allow intended users to make decisions with reasonable confidence?

C.3 Guidance on data selection and collection used for quantification

See 6.2.2. The characteristics of the data might be chosen by the company in accordance with pre-existing company practice, industry practice, best practice, interested party requirements, or might be mandated by regulatory schemes.

The organization should use primary activity data or underlying data in order to develop site-specific activity data, usually characterized as of higher quality. When no site-specific activity data (or the underlying data) are available, estimated activity data from literature or recognized databases (secondary data) should be used.

The organization should establish, document, implement and maintain written procedures for data flow activities for the monitoring and reporting of GHG emissions. It should ensure that the annual emission report resulting from data flow activities does not contain misstatements and conforms with the documentation required in 5.1 (see ISO 14033).

Written procedures for data flow activities should at least cover the following elements:

a) identification of the primary data sources;

b) each step in the data flow from primary data to annual emissions reflecting the sequence and interaction between the data flow activities;

c) the processing steps related to each specific data flow activity, including the formulae and data used to determine the emissions;

d) pertinent electronic data processing and storage systems used, as well as the interaction between such systems and other inputs, including manual input;

e) description of the way outputs of data flow activities are recorded.

C.4 Site-specific data

C.4.1 General

Site-specific data representative of direct GHG emissions/removals of the processes/assets under the financial or operational control of the organization undertaking the GHG inventory study should be collected.

Site-specific data should also be used where practicable for those processes that contribute significantly to indirect GHG emissions/removals, but that are not under the financial or operational control of the organization undertaking the GHG inventory and report.

NOTE Site-specific data refer to either direct GHG emissions (determined through direct monitoring, stoichiometry, mass balance or similar methodologies), activity data (inputs and outputs of processes that result in GHG emissions or removals) or calculation factors, such as emission factors and oxidation factors.

Site-specific data can be collected from a facility/equipment or can be averaged across facilities/equipment that have similar functions. They can be measured or modelled.

C.4.2 Analyses and sampling

In the collection of site-specific data, the organization should ensure that any analyses, sampling, calibrations and validations for the determination of data for quantification are carried out by applying methods based on recognized International Standards or national standards. Where no applicable published standards exist, suitable draft standards, industry best practice guidelines or other scientifically proven methodologies should be used, limiting sampling and measurement bias.

The use of any results from analysis should consider the applicability of the result. For example, they should be used just for the batch of fuel or material for which the samples have been taken, and for which the samples were intended to be representative. Results of several analysis during a specified period can also be combined for the determination of a specific parameter used for determination of emissions. For example, for a given month, a cement plant might collect samples on a regular basis of the feedstock of limestone, perform analysis of its CaO content, and apply an average result in the calculation of emissions for all limestone calcination during that month.

Where site-specific data are determined by analyses, it is best practice to record a sampling plan in the form of a written procedure for each fuel or material. The procedure should contain information on methodologies for the preparation of samples, including information on responsibilities, locations, frequencies and quantities, and methodologies for the storage and transport of samples. Derived samples should be representative for the pertinent batch or delivery period and free of bias. Where the analytical results indicate that the heterogeneity of the fuel or material significantly differs from what was originally expected, the original sampling plan might need to be adjusted.

The minimum frequency for sampling and analyses should be determined focusing on the desirable accuracy for the quantification approach. The specification of the minimum frequency required might need a specific study to evaluate the variability of the materials or consider historical data that is able to characterize its natural variability, regulatory requirements and expert judgement.

C.4.3 Laboratories

The organization should ensure that laboratories used to carry out analyses for the determination of site-specific data are accredited in accordance with associated norms for the pertinent analytical methods. Sometimes the use of fully accredited laboratories under specific norms might not be possible or would incur unreasonable costs, in which case it is recommended to demonstrate that the chosen laboratory has the specific technical competence to carry out accurate analyses for the site-specific data.

C.4.4 Calibration

The organization should ensure that measuring instruments are calibrated at least within the minimum frequency specified by the manufacturer, in order to operate free of error and within the required uncertainty range.

C.4.5 Data gaps

Where data pertinent to the quantification of emissions/removals of a source/sink are missing, an appropriate estimation method for determining conservative surrogate data for the respective time period and missing parameter should be used. Best practice is to establish the estimation method in a written procedure.

C.4.6 Record keeping

It is best practice to keep records of all pertinent data and information used in the quantification approach, as required in 6.2. Data to be retained might include:

a) the activity data;

b) a list of all default values used;

c) the full set of sampling and analysis results for the determination of site-specific data;

d) documentation of any substantial changes in the quantification approach;

e) results of calibration and maintenance of measuring instruments;

f) documentation justifying the selection of the quantification approach;

g) any uncertainty assessments, where applicable, as well as data used for the uncertainty analysis of the quantification approach;

h) a detailed technical description of the continuous measurement system, where applicable;

i) raw and aggregated data from the continuous measurement system, including documentation of changes over time, the log-book on tests, down-times, calibrations, servicing and maintenance, and documentation of any changes to the continuous measurement system.

The organization might be subject to a mandatory number of years of record keeping if required by law to report its GHG inventories. It is a usual practice to maintain information for a period of 10 years.

C.5 Non-site-specific data

A GHG inventory should use data that reduce bias and uncertainty as far as is practical by using the best quality data available. In this sense, site-specific data are generally preferred to non-site-specific data.

When the collection of site-specific data is not practicable, primary data based on global or regional averages, collected by regional or international organizations and which have undergone third-party verification should be used.

Secondary data and primary data that are not site-specific data should only be used for inputs where the collection of site-specific data is not practicable, or for processes of minor importance, and may include literature data (e.g. default emission factors), calculated data, estimates or other representative data.

In the case of non-site-specific data, an organization should keep a detailed record of the values and sources used for calculation factors (emission factors, oxidation factors, GWPs, etc.) and the reason for their selection, as required by 6.2 (documentation on quantification approach).

C.6 Guidance on the selection or development of GHG quantification model

See 6.2.3. The determination of which model to select will strongly depend on the degree of accuracy and cost which are considered admissible for the determination of the GHG emissions/removals from the source, given its significance. Accuracy and cost are often but not always in opposition, with increasing levels of accuracy requiring the implementation of more costly solutions. However, this relationship is not linear, and there is often a large scope for improvements of accuracy with no significant increase in cost.

The costs will be directly influenced by:

a) the monitoring systems that were pre-existent for purposes of process control (pre-existent practices);

b) the data quality requirements to achieve, using a determined GHG model, the specified uncertainty for the quantification approach;

c) market conditions, such as local availability of suppliers that can do, at reasonable cost, calibration, maintenance and repairs of equipment.

Generally, good practice is to follow the mandatory requirements specified within the country or region for the monitoring of GHG emissions and removals, as these requirements should have been assessed

by experts and deemed to strike an appropriate balance between local industrial practices and the necessary accuracy for GHG emissions and removals quantification in the local context.

However, it is possible that industrial systems might have been set in ways, such as for process control purposes or health and safety reasons, that do not fit with local standard regulatory practice. In this case, there might be a need to investigate the robustness of the existing practice and to assess the uncertainty of the specific quantification approach in order to determine its equivalence to recognized and/or regulatory quantification approaches. In doing so, the organization may apply the principles and methodologies of ISO/IEC Guide 98-3 in completing the uncertainty assessment. Higher levels of precision are generally acceptable but lower levels should be justified. For example, a typical justification is consideration of unreasonable costs.

The model selection should take into consideration quantitative and qualitative aspects of its data inputs, namely:

— accuracy: the accuracy of the data collected should reflect the GHG model and the final uncertainty required for the quantification approach;

— frequency: data should be collected at the appropriate frequency, being able to capture process variability that might lead to differences in emissions;

— timeliness: data should represent the reality of the time period for which they are being used to characterize emissions; otherwise, that should be noted as an assumption or estimation;

— completeness: the data series for the period in question should be complete, attending to the specified frequency of collection;

— control: whether the user is in control of the measurement devices and, if not, whether it is possible to obtain information about these devices;

— validity: the data are valid if they conform to specified requirements. The validity of data could be subject to an external verification. For example, a specified meter will produce reliable results only within its applicability range. If operated outside that range, its data output might not be considered valid.

All the aspects listed above have an impact on the accuracy, cost, technical feasibility and reproducibility of the quantification approach.

For example, in many cases for relatively small sources, it may be sufficient to document activity data through receipts that specify the physical amounts of fuel. In this case, the operator of the source may not control the measuring devices being used to monitor its activity data. Control of measuring devices would be the responsibility of the supplier or the actual producer of the fuel. Provided the transactions are done legally, one would assume that any metering involved would respect standardized and minimum practices in terms of measurement uncertainty, calibration, stability, etc. within the given jurisdiction. This practice relies on the supplier measurement system and considerably decreases the costs and enhances the technical feasibility of GHG quantification and reporting.

Other situations where issues of cost and feasibility might need to be considered include:

— switching from default calculation values to site-specific values;

— increasing the frequency of data collection and analyses per source/sink;

— where the specific measuring task does not fall under national legal metrological control, the substitution of measuring instruments with instruments complying with the requirements of legal metrological control of the given jurisdiction in similar applications;

— shortening of calibration and maintenance intervals of measuring instruments;

— for the determination of site-specific data, the use of laboratories that can demonstrate competence and ability to generate technically valid and accurate results or the use of external laboratories that are accredited for the determination of site-specific data;

— improvement of data flow activities and control activities reducing the inherent or control risk significantly.

C.7 Calculation of GHG emissions and removals

See 6.3. The final quantity of GHG emissions/removals will have a specific uncertainty, which should be within the limit values set by the organization. In accordance with 7.3, the organization should determine the uncertainty associated with the quantification approaches (e.g. data for quantification and models) and conduct an assessment that determines the uncertainty at the GHG inventory category level.

Sources of uncertainty can include:

a) parameter (or calculation factors) uncertainty, e.g. emission factors, activity data;

b) scenario uncertainty, e.g. use stage scenario or end-of-life stage scenario;

c) model uncertainty.

Annex D
(normative)

Treatment of biogenic GHG emissions and CO_2 removals

This annex provides requirements and guidance for the treatment of biogenic GHG emissions and CO_2 removals.

Anthropogenic biogenic GHG emissions and removals are a result of human activity. Anthropogenic biogenic GHG emissions (e.g. CO_2, CH_4 and N_2O) may result from biomass combustion as well as other processes (e.g. aerobic and anaerobic decomposition of biomass and soil organic matter).

Anthropogenic biogenic CO_2 emissions and removals shall be quantified and reported separately from anthropogenic emissions. Anthropogenic biogenic emissions and removals of other GHGs (e.g. CH_4 and N_2O) shall be quantified and reported as anthropogenic.

Non-anthropogenic biogenic GHG emissions and CO_2 removals caused by natural disasters (e.g. wildfire or infestation by insects) or natural evolution (e.g. growth, decomposition) may be quantified and, if so, shall be reported separately.

Annex B provides specific/sectorial guidance on GHG emission quantification.

Annex E
(normative)

Treatment of electricity

E.1 General

This annex provides requirements and guidance for the treatment of imported electricity consumed by the organization and of exported electricity generated by the organization.

The requirements and guidance described below for electricity also apply to imported and exported heating, steam, cooling and compressed air.

E.2 Treatment of imported electricity

E.2.1 General

Emissions from imported electricity consumed by the organization shall be quantified by the organization using the location-based approach by applying the emission factor that best characterizes the pertinent grid, i.e. dedicated transmission line, local, regional or national grid-average emission factor. Grid-average emission factors should be from the emissions year being reported, if available, or from the most recent year if not. Grid-average emission factors for imported consumed electricity shall be based on the average consumption mix of the grid from which electricity is consumed.

Emission factors may also include other indirect emissions associated with generation of electricity, such as:

— transmission and distribution losses;

— other life cycle processes used in generating the electricity such as extracting, transporting and processing the fuel, and/or the processes used in producing the capital equipment for generating the electricity.

The inclusion of those indirect emissions should be quantified, documented and reported separately (see B.4.1).

NOTE The location-based approach is a method to quantify indirect emissions from energy based on average energy generation emission factors for defined geographic locations, including local, subnational or national boundaries.

E.2.2 Additional information

When using contractual instruments in the procurement of its electricity, an organization may use the market-based approach, provided the contractual instruments comply with the following quality criteria:

— convey the information associated with the unit of electricity delivered together with the characteristics of the generator;

— is ensured with a unique claim;

— is tracked and redeemed, retired, or cancelled by or on behalf of the reporting entity;

— is as close as possible to the period to which the contractual instrument is applied and comprises a corresponding timespan;

— is produced within the country, or within the market boundaries where consumption occurs if the grid is interconnected.

For operations located in small island developing states (SIDS), a market-based approach may be used to quantify GHG emissions related to electricity consumption for such processes, irrespective of grid inter-connectivity.

NOTE 1 SIDS are defined by the United Nations[22].

When the organization uses those contractual instruments for GHG emission attributes, including renewable energy certificates, these transactions shall be documented and reported separately (see Clause 9).

NOTE 2 Contractual instruments are any type of contract between two parties for the sale and purchase of energy bundled with attributes about the energy generation, or for unbundled attribute claims.

EXAMPLE Contractual instruments can include energy attribute certificates, RECs, GOs, PPAs, green energy certificates, supplier specific emission rates, etc.

NOTE 3 The market-based approach is a method to quantify the indirect emissions from energy of a reporting organization based on GHG emissions emitted by the generators from which the reporting organization contractually purchases electricity bundled with contractual instruments, or contractual instruments on their own.

E.3 Treatment of exported electricity

The term “exported” refers to electricity that is supplied by the organization to users outside the organizational boundaries.

Direct GHG emissions from electricity generated and exported or distributed by the organization may be reported separately, but shall not be deducted from the organization’s total direct GHG emissions.

Annex F
(informative)

GHG inventory report structure and organization

To encourage completeness, consistency and readability, the organization should consider organizing the GHG report according to the following chapters.

a) Chapter 1: General description of the organization goals and inventory objectives.

   This chapter includes the description of the reporting organization, persons responsible, purpose of the report, intended users, dissemination policy, reporting period and frequency of reporting, data and information included in the report (list of GHGs taken into account and explained), and statements by the organization about verification.

b) Chapter 2: Organizational boundaries.

   This chapter includes the description and explanation of boundaries and consolidation methodologies.

c) Chapter 3: Reporting boundaries.

   This chapter includes the description and explanation of emissions categories that are considered.

d) Chapter 4: Quantified GHG inventory of emissions and removals.

   This chapter includes the quantified data results by emission or removal category, description of methodologies and activity data used, references and/or explanation and/or documentation of emission and removal factors, uncertainties and accuracy impacts on results (disaggregated by category), and description of planned actions for reducing uncertainty for the future inventory.

e) Chapter 5: GHG reduction initiative and internal performance tracking.

   The organization may report its GHG reduction initiatives and the results of its internal performance tracking.

An example of an illustrative template to provide a framework for reporting is given in Figure F.1.

Recommended format for consolidated statement of GHG emissions (values shown for illustration only)

	REPORTING COMPANY	NAME											
	Person or Entity responsible for the report	NAME	CONTACT										
	Reporting period covered	From	MM/DD/YYYY	To	MM/DD/YYYY								
	Organizational boundaries	Attached document											
	Reporting boundaries	Attached document											
	EMISSIONS	**Notes**	**20xx CO_2e TOTAL (Tonnes p.a.)**	Carbon dioxide (CO_2)	Methane (CH_4)	Nitrous oxide (N_2O)	Hydrofluoro-carbons (weighted average) (HFCs)	Perfluoro-carbons tonnes (weighted average) (PFCs)	Sulfur hexafluoride (SF_6)	Nitrogen trifluoride (NF_3)	Quantitative uncertainty	Qualitative uncertainty	
			GWP	1	30	265	5 000	4 000	23 500	16 100			
1	**Category 1 : Direct GHG emissions and removals in tonnes CO_2e (1)**		**83 205**	**83 050**	**149**	**6**	**0**	**0**	**0**	**0**			
1.1	Direct emissions from stationary combustion		2 050	2 050	0	0	0	0	0	0	7%		
1.2	Direct emissions from mobile combustion		81 005	81 000	5	0	0	0	0	0	7%		
1.3	Direct process emissions and removals arise from industrial processes		0	0	0	0	0	0	0	0			
1.4	Direct fugitive emissions arise from the release of greenhouse gases in anthropogenic systems		0	0	0	0	0	0	0	0			
1.5	Direct emissions and removals from Land Use, Land Use Change and Forestry		0	0	0	0	0	0	0	0			
	Direct emissions in tonnes of CO_2 from biomass		**718**	718									
	Indirect Emissions in tonnes CO_2e (2)	**S/NS[*]**	**4 157 450**										
2	**Category 2 : Indirect GHG emissions from imported energy (3)**		**70 000**										
2.1	Indirect emissions from imported electricity		60 000								15%		
2.2	Indirect emissions from imported energy		10 000								10%		
3	**Category 3 : Indirect GHG emissions from transportation**		**614 950**										
3.1	Emissions from Upstream transport and distribution for goods		153 200										C
3.2	Emissions from Downstream transport and distribution for goods		320 000										B
3.3	Emissions from Employee commuting includes emissions		12 200										C
3.4	Emissions from Client and visitor transport	NS											
3.5	Emissions from Business travels		129 550										B
4	**Category 4: Indirect GHG emissions from products used by organization**		**3 372 500**										
4.1	Emissions from Purchased goods		3 202 500										D
4.2	Emissions from Capital goods		125 000										D
4.3	Emissions from the disposal of solid and liquid waste		45 000										D
4.4	Emissions from the use of assets	NS											
4.5	Emissions from the use of services that are not described in the above subcategories (consulting, cleaning, maintenance, mail delivery, bank, etc.)	NS											
5	**Category 5: Indirect GHG emissions associated with the use of products from the organization**		**100 000**										
6.1	Emissions or removals from the use stage of the product		100 000										B
6.2	Emissions from downstream leased assets	NS											
6.3	Emissions from end of life stage of the product	NS											
6.4	Emissions from investments	NS											
6	**Category 6: Indirect GHG emissions from other sources**	**NS**											
	REMOVALS (4)												
	Direct removals in tonnes CO_2e		**100**	**100**	**0**	**0**	**0**	**0**	**0**	**0**			C
	STORAGE (5), (6), (7)												
	Total storage as of year end in tonnes CO_2e		**10**	**10**	**0**	**0**	**0**	**0**	**0**	**0**			C
	CARBON FINANCIAL INSTRUMENTS (8)												

				Market based emission factors compliant with ISO 14064-1 Annex E		
Total Renewable Electricity purchased in kWh		**575 000** kWh				
Renewable Electricity purchased in kWh with contractual instruments compliant with ISO 14064-1 Annex E		150 000 kWh		**13** gCO_2e/kWh	1,9 tCO_2e	See attached document
Renewable Electricity purchased in kWh with contractual instruments compliant with ISO 14064-1 Annex E		45 000 kWh		**6** gCO_2e/kWh	0,2 tCO_2e	See attached document
Renewable Electricity purchased in kWh with contractual instruments compliant with ISO 14064-1 Annex E	375 000	180 000 kWh		**15** gCO_2e/kWh	2,7 tCO_2e	See attached document
Renewable Electricity purchased in kWh with contractual instruments not compliant with ISO 14064-1 Annex E criteria		200 000 kWh				
Offsets from GHG Scheme AA in tonnes CO_2e		**95 000** CO_2e				
Credits from GHG Scheme BB in tonnes CO_2e		**125 000** CO_2e				

Other related information	
Performance tracking (emissions and removals by metric, e.g. tonnes CO_2e per annual revenue)	See attached document
Base year GHG emissions, removals, and stocks; and adjustments to base year	See attached document
Disclosure of most significant sources, sinks, and reservoirs	See attached document
Statements of emissions (CO_2e) per unit of relevant uniits	See attached document
Statement of emission reduction initiatives	See attached document
Significancy criteria	See attached document
Uncertainty assessment	See attached document

Notes

[*] Significant / Non significant.

Key

(1) Category 1 (direct emission) is subdivided in accordance with the recommendations of Annex B.

(2) Indirect emissions are subdivided in accordance with the recommendations of Annex B and are fully compatible with standards requirements.

(3) This category may include transmission and distribution emissions.

(4) This document does not provide any recommendations or requirements for removal subdivision.

(5) Storage is not addressed in this document (no recommendation or requirements). Reporting this category is optional.

(6) The storage category includes GHGs in sinks and reservoirs. These may also be considered "pools" of carbon as opposed to "fluxes" of carbon. Carbon stored in soil can be considered "geologic," or, at the reporter's option, this category may be further subdivided.

(7) Reporters may include in this category GHGs stored in refrigeration equipment and stocks of fuel, as well as carbon stored in products (e.g. wood furniture).

(8) If reported, carbon financial instruments are neither added nor subtracted from the organization inventory in accordance with 9.3.3.

NOTE These are the only fixed parts of the framework. The labelling of entries under each of these categories is a matter of choice by the reporting organization, although adherence to International Standards and good accounting practices is encouraged.

Figure F.1 — Illustrative template to provide a framework for reporting

Annex G
(informative)

Agricultural and forestry guidance

G.1 General

Globally, agriculture and food production activities are responsible for a significant portion of annual GHG emissions. The major sources of agricultural emissions include: enteric fermentation (CH_4), application of nitrogenous fertilisers (N_2O), manure management (CH_4) and (N_2O), and rice cultivation (CH_4). Agriculture involves the production of crops, livestock, poultry, fungi, insects and other inputs for industry.

This annex is intended to assist crop and livestock producers and related farm-level organizations to quantify and report their direct, indirect and biogenic GHG emissions and removals. This guidance will also be helpful to upstream or downstream organizations that seek to understand their value chain GHG impacts from agriculture. To achieve harmonization, this annex incorporates information from Reference [13]. The topics described follow the clauses in this document. Refer to Clause 1 for the Scope, Clause 3 for terms and definitions, and Clause 4 for the principles.

G.2 GHG inventory boundaries and quantification of GHG emissions and removals

See Clauses 5 and 6. For the quantification of GHG emissions and removals, activity data needs to be collected from various activities: enteric fermentation; manure management; application of synthetic fertilizer, livestock waste and crop residues to soils; rice cultivation; drainage and tillage of managed soils; open burning of crop residues and swiddens; land use change and other areas outlined in G.4.6.

If site-specific data are applied, they should be transparently documented. If a national approach is used, the data should be based on a verified study, a peer reviewed study or similar scientific evidence and should be documented.

G.3 Accounting for carbon stocks

Carbon stocks represent the quantity of carbon (C) stored in GHG reservoirs, including the C stocks in soil organic matter, above-ground and below-ground biomass, dead organic matter (DOM), and harvested wood products. These C stocks are reversible, and will eventually be emitted to the atmosphere – having implications for handling C stocks within GHG inventories. They should be reported separately under biogenic carbon. The net GHG flux is the net sum of CO_2 emissions to and removals from the atmosphere.

The changes to C stocks can be quantified using data on:

a) stock size at two points in time (e.g. metric tonnes C/hectare), and

b) net balance of CO_2 emissions and CO_2 removals to or from a stock measured in units of mass of CO_2.

For both quantifications, organizations need to use methods that use consistent soil depths. If organizations report data on stock size, they can be converted to net flux data by multiplying the mass of stock change by 44/12, i.e. the ratio of the molecular weights of CO_2 and elemental carbon. When accounting for sequestration in wetland environments with organic soils, the rates of C sequestration are relatively slow, and can be assumed to be negligible, and can therefore be excluded.

There may be some cases when carbon stocks can change due to natural disturbances, payments for environmental services (PESs) and changes in areas set for conservation. In cases such as these, the CO_2 fluxes should be accounted for in the same way as agricultural activities.

G.4 Amortizing changes in carbon stocks over time

G.4.1 General

Changes in management practices, such as adoption of no-till, can influence C stocks for decades. Amortizing changes in carbon stocks may be needed if the estimated data are generated for the entire transition period. CO_2 fluxes can be amortized for: sequestration in woody biomass stocks; sequestration in organic C stocks for mineral soils; emissions from organic C stocks for mineral soils; and emissions from woody biomass stocks. Amortizing emissions from the decomposition of DOM is optional. Organizations may assume an amortization period of 20 years for DOM stocks and organic C stocks in mineral soils, which is the default time horizon in national GHG inventories submitted to the United Nations Framework Convention on Climate Change (UNFCCC).

G.4.2 Base year

For the base year in agriculture, multi-year base periods are recommended, as averaging GHG flux data from at least a three-year base period may be a more representative base period. If a base-year has already been set for non-agricultural emissions, then a multi-year base period can be centred on that year. Base-year inventories may need to be recalculated when changes occur to the inventory boundaries or development processes significantly impact the base inventory, such as changes in ownership/control or the calculation methodologies used.

G.4.3 GHG categories

Agricultural emissions and removals are reported under:

a) direct emissions,

b) indirect emissions, and

c) biogenic emissions and removals, which are reported separately.

Emission fluxes are based on emissions (sources) and removals (sinks). Agricultural direct emissions categories/subcategories may be distinguished between two types: mechanical and non-mechanical (see Table G.1). The categories in each type can be further divided by subcategory. The fluxes from each classification differ, with important implications for GHG inventories. In addition to reporting of direct, indirect and biogenic emissions/removals, reporting may optionally include organizational emissions for their upstream and downstream activities. Examples of agricultural indirect emissions categories/subcategories are described in Tables G.2 and G.3. Biogenic carbon from agriculture subcategories are described in Table G.4. Table G.5 provides examples of GHGs that should not be reported.

Table G.1 — GHG Reporting for direct emissions from agriculture

GHG emissions sources Category – Subcategory		Examples	GHGs reported: Using units specified
Category 1: Direct GHG emissions			
1.1	**Direct emissions from stationary combustion**		
	Stationary equipment – fossil	Generators, boilers, CHP, milling, dryers, irrigation	CO_2, CH_4, N_2O, CO_2e
	Stationary equipment – biogenic	As above	CH_4, N_2O, CO_2e
1.2	**Direct emissions from mobile combustion**		
	Mobile equipment – fossil	Tilling, sowing, harvesting, transport	CO_2, CH_4, N_2O, CO_2e

Table G.1 *(continued)*

GHG emissions sources Category – Subcategory		Examples	GHGs reported: Using units specified
	Mobile equipment – biogenic	As above	CH_4, N_2O, CO_2e
1.3	**Industrial process**	N/A	N/A
1.4	**Direct fugitive emissions arise from the release of GHGs in anthropogenic systems**		
	Refrigeration, air conditioning	Freezers, chillers, coolers	HFCs, PFCs, CO_2e
	Addition of fertilizers and amendments	Synthetic fertilizer formulations, e.g. anhydrous ammonia or ammonium nitrate, urea	N_2O, CO_2e
	Addition of livestock waste to soils	Manure	CO_2, CH_4, N_2O, CO_2e
	Addition of crop residues to soils	Corn stocks or wheat straw	CO_2, CH_4, N_2O, CO_2e
	Tillage and drainage of soils	Ploughing, tile drainage	CO_2, CH_4, N_2O, CO_2e
	Enteric fermentation	Ruminants	CH_4, CO_2e
	Addition of lime to soils		CO_2, CO_2e
	Paddy rice cultivation		CH_4, CO_2e
	Open burning of savannahs, crop residues left on fields, DOM		CH_4, N_2O, CO_2e
	Anaerobic digestion		CH4, N_2O, CO_2e
	Composting organic waste		CH_4, CO_2e
1.5	**Direct emissions and removals from land use, land use change and forestry**		
	Direct land use change (dLUC)	CO_2 emissions from the conversion of: — forests into ranch land or cropland, or — wetlands to cropland	CO_2, CH_4, N_2O, CO_2e

Table G.2 — Reporting for indirect emissions from agriculture

	GHG indirect emissions Category – Subcategory	Examples	GHGs reported: Using units specified
2	**Category 2: Indirect GHG emissions from imported energy**		
2.1	Indirect emissions from imported electricity	Refer to standard for grid emissions calculations	CO_2, CH_4, N_2O, CO_2e

Organizational (upstream/downstream) emissions from agriculture, as shown in Table G.3, are optional but encouraged.

Table G.3 — Reporting of organizational (upstream/downstream) emissions from agriculture

GHG emissions Category – Subcategory		Examples	GHGs reported: Using units specified
3	**Category 3: Indirect GHG emissions from transportation**		
3.1	Emissions from upstream transport and distribution for goods	Trucking, warehousing	CO_2, CH_4, N_2O, CO_2e
3.2	Emissions from downstream transport and distribution for goods	Trucking, warehousing	CO_2, CH_4, N_2O, CO_2e
4	**Category 4: Indirect GHG emissions from products used by organization**		
4.1	Emissions from purchased goods		
	Energy production	Fossil fuels	CO_2, CH_4, N_2O, CO_2e

Table G.3 *(continued)*

GHG emissions Category – Subcategory		Examples	GHGs reported: Using units specified
	Fertilizer production	Nitrogen, urea, phosphorus, potash	CO_2, CH_4, N_2O, CO_2e
	Feed production	Milling, drying	CO_2, CH_4, N_2O, CO_2e
	Agrochemical production	Pesticides, herbicides, fungicides	CO_2, CH_4, N_2O, CO_2e

Table G.4 — Biogenic carbon from agriculture

	GHG emissions/ removals Category – Subcategory	Examples	GHGs reported: Using units specified
Category 1: Direct GHG emissions and removals			
Direct emissions and removals from land use, land use change and forestry	Land use management		
		CO_2 fluxes to/from C stocks in soils	CO_2, CO_2e
		CO_2 fluxes to/from above and below ground woody biomass (i.e. woody vegetation in orchards, vineyards and agroforestry systems)	CO_2, CO_2e
		CO_2 fluxes to/from dead organic material (DOM)	CO_2, CO_2e
		Combustion of crop residues for non-energy purposes	CO_2, CO_2e
		Managed woodland (e.g. tree strips, timber belts)	CO_2, CO_2e
	C sequestration due to land use change (LUC)	CO_2 removals by soils and biomass following afforestation or reforestation	CO_2, CO_2e
Direct emissions from mobile combustion	Biofuel combustion	Mobile equipment: tilling, sowing, harvesting, transport	CO_2, CO_2e
Direct emissions from stationary combustion		Stationary equipment: generators, boilers, CHP, milling, dryers, irrigation	CO_2, CO_2e
Direct fugitive emissions arise from the release of GHGs in anthropogenic systems	Composting organic waste		CO_2, CO_2e
Direct fugitive emissions arise from the release of GHGs in anthropogenic systems	Oxidation of horticultural growing media		CO_2, CO_2e

For natural disturbances, the GHG fluxes may be reported in a line item separate from the direct, indirect, and biogenic carbon categories.

Companies should not report the information shown in Table G.5.

Table G.5 — GHGs that should not be reported

Category – Subcategory	Examples	GHGs not reported
CO_2 removals by herbaceous vegetation	Annuals, biennials or perennials with no woody stem	Not reported
CO_2 fluxes to/from livestock.	The carbon that is part of animal tissues, or from animal respiration should not be reported in an inventory	

G.4.4 Carbon storage in agricultural products

Most agricultural food products, including grains, fruits, vegetables, livestock, poultry and related products, are short-lived and consumed rapidly after harvest. For these products, GHG emissions and removals may be included as if released or removed at the beginning of the assessment period. On the other hand, specific agricultural products have the potential to store carbon for longer periods of time. For example, hemp can also be refined into products, such as paper, textiles, clothing, biodegradable plastics and construction materials, and cotton is used to make a number of textile products.

Requirements and guidance related to carbon storage in agricultural products are described in ISO 14067.

G.4.5 Mitigation activities

See Clause 7. Examples of agricultural activities and practices that can reduce GHG emissions and improve farm performance include: sequestration and carbon storage in soils; cover crops; conservation tillage; wind breaks; precision farming combined with GPS systems (fertilizer management); mitigating GHG emissions from ruminants; switching to renewable energy systems (solar, wind, hydro, biogas); switching to renewable water heating systems; switching to intermittent flooding practices for rice, bioenergy with carbon capture and storage (BECCS).

G.4.6 Reporting GHG data

Refer to Clause 9 for the reporting requirements, including the reporting boundaries, reporting period, the base year and the base-year inventory by category, and the specific exclusions of sources or operations from the inventory. Reporting for all of the GHGs specified in this document is required: it is disaggregated by GHG and reported in units of both metric tonnes by GHG and metric tonnes CO_2-equivalent (CO_2e) per GHG.

G.5 Areas outside of this agricultural guidance annex

This annex does not provide agricultural guidance in the following areas:

— it does not include methods for project-level accounting;

— it does not consider the permanence of C sequestration; instead, fluxes to/from C stocks are simply reported as they occur (or are projected to occur);

NOTE 1 For guidance on these areas, see ISO 14064-2.

— it does not include methods for product-level GHG accounting (e.g. product category rules);

NOTE 2 For guidance on these areas, see ISO 14067.

— it does not provide accounting methods for indirect land use change (iLUC);

— it does not address the accounting steps needed to create offset credits from soils, biomass or other sources located on farms, reforestation or restoration of degraded lands, or changes in fertilizer management;

— it does not consider agricultural offset and renewable energy projects that are potential sources of offset credits:

  — wind turbines, solar panels, solar water heating, anaerobic digesters for CHP, micro-scale hydroelectricity (typically less than ~100 kW);

  — growing trees, short rotation woodland, other sources of biomass fuel stock;

  — installing anaerobic digesters to produce methane as fuel for electricity or heat;

— it does not address environmental impacts other than GHG fluxes, such as emissions of air pollutants, water impacts and use, eutrophication, health and other environmental impacts. Consequently, the guidance in this annex cannot be used by itself to evaluate the possible trade-offs between GHG emissions reductions and other environmental impacts of a given farming practice.

Indirect land use change (iLUC) should be considered in carbon footprint (CFP) studies, once an internationally agreed procedure exists. All choices and assumptions shall be justified and documented.

NOTE 3 There is ongoing research to develop methodology and data for the inclusion of iLUC in GHG reporting.

Annex H
(informative)

Guidance for the process of identifying significant indirect GHG emissions

H.1 General

See 5.2.3. Organizations should use the following process to identify, evaluate and select significant indirect emissions.

H.2 Identify the intended use of its GHG inventory

Intended use may include regulatory or voluntary disclosure schemes, public commitment, emissions trading schemes, an organization's performance and progress tracking system for the reduction of emissions and/or removals, mitigation programmes, an organization's annual report, investors' information, the identification of carbon risks or opportunities and a due diligence report.

H.3 Define criteria to evaluate the significance of indirect emissions, consistent with the intended use of the inventory

H.3.1 Consider the way the principles may apply to determine criteria.

— Relevance: Consider which indirect emissions or removals need to be selected in order to meet the needs of the intended user(s) (e.g. customers, suppliers, investors, governments, NGOs) either on their own or in combination with other sources.

— Completeness: Consider which indirect emissions and removals need to be included in the inventory for the inventory to include all relevant sources.

— Consistency: Consider whether inclusion of the indirect emissions and removals is necessary for a user to make meaningful comparisons (e.g. GHG-related information within the inventory).

— Accuracy: Consider whether the inclusion of the indirect emissions and removals, on their own or in combination with other sources, is necessary for the inventory totals to be reasonably free from uncertainty.

— Transparency: Consider whether exclusion of the indirect emissions and removals, without disclosure and justification, impedes intended users from making decisions with reasonable confidence.

H.3.2 Criteria used to evaluate significance of indirect emissions may include the following.

— Magnitude: The indirect emissions or removals that are assumed to be quantitatively substantial.

— Level of influence: The extent to which the organization has the ability to monitor and reduce emission and removals (e.g. energy efficiency, eco-design, customer engagement, terms of reference).

— Risk or opportunity: The indirect emissions or removals that contribute to the organization's exposure to risk (e.g. climate-related risks such as financial, regulatory, supply chain, product and customer, litigation, reputational risks) or its opportunity for business (e.g. new market, new business model).

— Sector-specific guidance: The GHG emissions deemed as significant by the business sector, as provided by sector-specific guidance.

— Outsourcing: The indirect emissions and removals resulting from outsourced activities that are typically core business activities.

— Employee engagement: The indirect emissions that could motivate employees to reduce energy use or that federate team spirit around climate change (e.g. energy conservation incentives, carpooling, internal carbon pricing).

H.4 Identify and evaluate indirect emissions

For each indirect emissions category, identify and evaluate indirect emissions as a screening step without detailed calculation, using resources such as internal and external experts, sector-specific GHG guidance, a literature review or a third-party database.

NOTE The magnitude of indirect GHG emissions warrants special attention in this screening step.

Organizations may map their value chain in order to identify indirect emissions within the categories defined in 5.2.4 and the subcategories defined in Annex B.

H.5 Apply criteria to select significant indirect emissions

As described in 5.2.3, organizations determine the significance of indirect emissions and removals by applying previously defined criteria. In the majority of cases, the application of criteria to a particular source of indirect emissions or removals results in a clear determination of whether the emission or removal is significant.

In some cases (i.e. if the criteria are qualitative rather than quantitative) the application of criteria may not result in an obvious determination of whether the source of indirect emissions or removals is significant. Consequently, deeper analysis of the criteria may be helpful.

EXAMPLE An indirect emissions source (e.g. goods used by the organization) is estimated to be approximately 10 % of the organization's total indirect emissions. The relevant data would be very expensive to obtain and the accuracy of quantified emissions would be poor.

The organization should balance the criteria of estimated magnitude with the accuracy and cost of obtaining the data, as well as other criteria (e.g. risk and opportunity, needs of intended users) in order to determine whether the indirect emissions source is significant or not.

The organization should justify its determination of whether indirect emissions and removals are significant.

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ICS 13.020.40

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