Green House Gases Standard

ImpactChain

Version 2.5

Foreword & Disclaimer

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Glossary of Terms

GHG (Greenhouse Gases): Gases that trap heat in the atmosphere, contributing to the greenhouse effect. Key GHGs include carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulfur hexafluoride (SF_6), and nitrogen trifluoride (NF_3).

IPCC (Intergovernmental Panel on Climate Change): The United Nations body for assessing the science related to climate change, providing scientific reports that guide global climate policy.

HFC (Hydrofluorocarbons): Synthetic greenhouse gases used mainly in refrigeration, air conditioning, and insulating foams. They are potent GHGs with high Global Warming Potential (GWP).

EEIO (Environmentally Extended Input–Output Analysis): A method combining economic input–output tables with environmental data to estimate indirect environmental impacts, such as supply-chain-related emissions.

ISO (International Organization for Standardization): An independent, non-governmental international body that develops standards, including ISO 14064 for GHG accounting and ISO 14040-series for life cycle assessment.

ICGHGS (ImpactChain Greenhouse Gas Standards): A framework that establishes standardized methodologies for measuring, reporting, and verifying GHG emissions and removals, with a focus on impact assessment across the value chain.

CDP (Carbon Disclosure Project): A global disclosure system that enables companies, cities, and governments to measure and manage environmental impacts, especially GHG emissions, water, and forests.

GHG Protocol: The most widely used international accounting tool for government and business leaders to understand, quantify, and manage greenhouse gas emissions across Scope 1, 2, and 3 categories.

LCA (Life Cycle Assessment): A methodological framework for assessing environmental impacts associated with all the stages of a product's life, from raw material extraction to disposal.

Scope 1 Emissions: Direct GHG emissions from sources owned or controlled by the company (e.g., fuel combustion, company vehicles).

Scope 2 Emissions: Indirect GHG emissions from the generation of purchased electricity, steam, heating, and cooling consumed by the company.

Scope 3 Emissions: All other indirect emissions occurring in the value chain of the company, including both upstream and downstream emissions.

Carbon Footprint: The total GHG emissions caused directly and indirectly by an individual, organization, event, or product, expressed as carbon dioxide equivalents (CO_2e).

Carbon Neutrality: A state achieved when an entity balances its carbon emissions with equivalent carbon removals or offsets.

Net Zero: A target to reduce greenhouse gas emissions to as close to zero as possible, with any remaining emissions re-absorbed by the environment (e.g., forests, oceans, carbon capture).

GWP (Global Warming Potential): A metric developed by the IPCC to compare the warming impacts of different GHGs relative to CO_2 over a specific time horizon (commonly 100 years).

MRV (Monitoring, Reporting, and Verification): The processes and methodologies used to ensure the accurate measurement and transparency of GHG emissions and reductions.

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1. INTRODUCTION

1.1 Under the ICGHGS(impactChain Green House Gas Standards), organizations are required to report:

- Scope 1 emissions – Direct emissions from owned or controlled sources.
- Scope 2 emissions – Indirect emissions from the generation of purchased energy.

1.2 Reporting of Scope 3 emissions is optional but strongly encouraged to achieve comprehensive transparency across the value chain.

1.3 To ensure uniformity and comparability, organizations must apply decisions consistently across all scopes. For instance, the choice of consolidation approach—

- Equity share
- Operational control
- Financial control

—must be applied consistently across Scope 1, Scope 2, and Scope 3 reporting.

2. SCOPE OF THE STANDARD

2.1 The ICGHGS applies to emissions generated from organizational value chain activities during the reporting period (typically one year).

2.2 The framework covers six primary greenhouse gases:

1. Carbon dioxide (CO_2)
2. Methane (CH_4)
3. Nitrous oxide (N_2O)
4. Hydrofluorocarbons (HFCs)
5. Perfluorocarbons (PFCs)
6. Sulphur hexafluoride (SF_6)

3. BASIC PRINCIPLES

3.1 GHG accounting and reporting of a Scope 3 inventory under the ICGHGS shall be based on the following principles:

a. Relevance
b. Completeness
c. Consistency
d. Transparency
e. Accuracy

3.1.1 Relevance

Ensure that the GHG inventory appropriately reflects the emissions of the organization and supports the decision-making needs of users, both internal and external.

3.1.2 Completeness

Account for and report on all GHG emission sources and activities within the defined inventory boundary. Any exclusions must be specifically disclosed and justified.

3.1.3 Consistency

Apply consistent methodologies to enable meaningful tracking of performance over time. Any changes to data, boundaries, methods, or other relevant factors must be transparently documented.

3.1.4 Transparency

Present all relevant issues factually and coherently, supported by a clear audit trail. Disclose assumptions, methodologies, calculation approaches, and data sources used.

3.1.5 Accuracy

Quantification of GHG emissions must avoid systematic over- or under-estimation to the greatest extent possible. Uncertainties should be minimized, ensuring sufficient accuracy to enable users to make informed decisions with confidence in the integrity of the reported information.

4. TRADITIONAL BUSINESS GOALS

4.1 Identify and Understand Risks and Opportunities Associated with Value Chain Emissions

4.1.1 Identify GHG-related risks across the value chain.

4.1.2 Recognize potential new market opportunities arising from emissions reduction initiatives.

4.1.3 Strengthen investment and procurement decisions by integrating emissions-related considerations.

4.2 Identify Reduction Opportunities, Set Targets, and Track Performance

4.2.1 Detect GHG “hot spots” within the value chain and prioritize areas for targeted reduction.

4.2.2 Establish measurable Scope 3 GHG reduction targets.

4.2.3 Monitor, quantify, and report GHG performance over time to ensure continuous improvement.

4.3 Engage Value Chain Partners in GHG Management

4.3.1 Collaborate with suppliers, customers, and stakeholders to achieve emissions reductions.

4.3.2 Expand accountability, transparency, and emissions management throughout the supply chain.

4.3.3 Enhance disclosure on organizational efforts to engage suppliers in sustainability practices.

4.3.4 Reduce energy use, costs, and risks within the supply chain while avoiding future liabilities related to emissions.

4.3.5 Improve overall supply chain efficiency by minimizing material, resource, and energy consumption.

4.4 Enhance Stakeholder Information and Corporate Reputation through Public Reporting

4.4.1 Strengthen reputation and accountability through transparent public disclosure.

4.4.2 Address the needs of key stakeholders—such as investors, customers, civil society, and regulators—by reporting emissions, progress toward targets, and demonstrating environmental responsibility.

4.4.3 Participate in relevant reporting and management programs to further enhance transparency of GHG-related information.

4.5 Emissions Targets

4.5.1 Absolute Emissions Reduction

Definition: Overall % reduction in GHG emissions emitted to the atmosphere in the target year, irrespective of business growth, relative to the base year.

Example: Reduce absolute scope 3 emissions from Purchased Goods and Services 45% by 2030 from a 2020 base year.

4.5.2 Emissions Intensity Reduction

Definition: % reduction in emissions relative to a specific business metric, either a physical unit of product or per economic $ value added, relative to the base year.

Example: Reduce scope 3 emissions by 50% per unit of product by 2030, from a 2020 base year.

4.5.3 Supplier or Customer Engagement

Definition: Targets to engage a targeted population of suppliers or customers to set their own SBTs.

Example: Suppliers covering 70% of emissions from Purchased Goods and Services will set science-based targets by 2027.

5. GASES INCLUDED

5.1 The ICGHGS framework applies to the following groups of greenhouse gases:

5.1.1 Primary Greenhouse Gases

- Carbon dioxide (CO_2)
- Methane (CH_4)
- Nitrous oxide (N_2O)

5.1.2 Industrial Greenhouse Gases

- Hydrofluorocarbons (HFCs), including but not limited to:
  - HFC-23 (CHF_3)
  - HFC-134a (CH_2FCF_3)
  - HFC-152a (CH_3CHF_2)
- Perfluorocarbons (PFCs), including:
  - CF_4, C_2F_6, C_3F_8, C_4F_{10}, c-C_4F_8, C_5F_{12}, C_6F_{14}
- Sulphur hexafluoride (SF_6)
- Nitrogen trifluoride (NF_3)
- Trifluoromethyl sulphur pentafluoride (SF_5CF_3)

5.1.3 Halogenated Ethers

- $C_4F_9OC_2H_5$
- $CHF_2OCF_2OC_2F_4OCHF_2$
- $CHF_2OCF_2OCHF_2$

5.1.4 Other Halocarbons

- CF_3I
- CH_2Br_2
- $CHCl_3$
- CH_3Cl
- CH_2Cl_2

6. TARGETS AND MITIGATION APPROACHES

6.1 Near-Term Targets

What:

6.1.1 Near-term science-based targets are defined as 5–10 year GHG mitigation milestones aligned with 1.5°C pathways.

6.1.2 Upon reaching the initial near-term target date, organizations must establish new near-term targets to ensure continued progress toward long-term objectives.

Why:

6.1.3 Near-term targets mobilize immediate action, enabling significant emissions reductions by approximately 2030.

6.1.4 These reductions are essential to remain within the global emissions budget and cannot be substituted by long-term commitments alone.

6.2 Long-Term Targets

What:

6.2.1 Long-term science-based targets outline the level of value chain emissions reductions required for organizations to align with net-zero goals by 2050 or earlier, in accordance with 1.5°C pathways.

Why:

6.2.2 These targets provide a foundation for economy-wide alignment and strategic long-term planning, ensuring organizations contribute proportionately to global emissions reduction goals.

6.3 Neutralization

What:

6.3.1 Neutralization refers to actions taken to remove carbon from the atmosphere and permanently store it, offsetting residual emissions that remain after long-term reduction targets have been achieved.

6.3.2 This requirement also applies to emissions excluded from the long-term target boundary and overall GHG inventory.

Why:

6.3.3 While most organizations will reduce emissions by at least 90% through long-term targets, some residual emissions may remain due to operational or technological limitations.

6.3.4 To claim net-zero status, organizations must both achieve long-term targets across all scopes and neutralize residual emissions to eliminate climate impact.

6.4 Beyond Value Chain Mitigation

What:

6.4.1 Beyond value chain mitigation includes mitigation measures and investments outside an organization's direct value chain.

6.4.2 This may include initiatives that avoid or reduce emissions, or that remove and store GHGs from the atmosphere.

Why:

6.4.3 Addressing the climate and ecological crises requires organizations to go beyond minimum compliance and actively support global mitigation efforts.

6.4.4 While decarbonizing the value chain and achieving net-zero by 2050 is the minimum societal expectation, additional investments accelerate the transition and increase the likelihood of staying within the 1.5°C global carbon budget.

6.4.5 These efforts, however, must complement—not substitute—rapid and deep reductions within the organization's own value chain.

6.5 Renewable Electricity and Intensity Reduction Methods

6.5.1 Renewable Electricity (Scope 2)

6.5.1.1 Description

- The renewable electricity (RE) method is an acceptable alternative to scope 2 emission reduction targets.
- Companies set targets to procure at least 80% renewable electricity by 2025 and 100% by 2030 using Renewable Energy Certificates (RECs) or virtual Power Purchase Agreements (vPPAs).
- RE targets can be initially set as near-term targets and later maintained to ensure consistent procurement levels over time.

6.5.1.2 Minimum Acceptable Thresholds

- Targets must align with limiting warming to 1.5°C, with procurement thresholds defined between 2025 and 2030.

6.5.1.3 Advantages

- Easy to track progress.
- Once achieved, RE targets can be adapted as maintenance targets to ensure ongoing procurement.

6.5.1.4 Disadvantages

- Accessibility depends on the company's operational regions and ability to demonstrate active sourcing of renewable electricity.
- Market instruments like RECs may be of lower quality; PPAs provide long-term commitments and are considered more robust.

6.5.2 Physical Intensity Reduction (Scope 3)

6.5.2.1 Description

- Companies define a physical intensity metric and set targets to reduce emissions intensity consistent with well-below 2°C for near-term and 1.5°C for long-term targets.
- Near-term: minimum 7% year-on-year reduction, with adjustments for base years after 2020.
- Long-term: minimum 97% overall reduction.

6.5.2.2 Eligible Denominators

- Representative company activity related to the emissions boundary. Examples:
  - ☐ Company size (e.g., employees, office/retail area)
  - ☐ Production input (e.g., raw materials procured)
  - ☐ Production output (e.g., volume produced, sales)
  - ☐ Level of service (e.g., payload/passenger distance, number of users/subscriptions)
- Non-physical denominators like profit, revenue, or value added cannot be used.

6.5.2.3 Advantages

- Reflects GHG performance independent of business growth.
- Increases comparability among companies with similar inventory consolidation and product mix.

6.5.2.4 Disadvantages

- May not suit companies with diverse product mixes.

- High data requirements.
- Absolute emissions may rise even if intensity decreases, potentially reducing credibility.

6.5.3 Economic Intensity Reduction (Scope 3)

6.5.3.1 Description

- Companies reduce economic emissions intensity (e.g., tCO2 per unit of value added) consistent with well-below 2°C near-term and 1.5°C long-term targets.
- Near-term: minimum 7% year-on-year reduction, adjusted for base years after 2020.
- Long-term: minimum 97% overall reduction.

6.5.3.2 Advantages

- Normalizes emissions across sectors with varying products.
- Provides flexibility for companies prioritizing growth.

6.5.3.3 Disadvantages

- Suitable only for sectors with limited product price fluctuations.
- Tracking progress can be difficult during financial losses.
- External factors (commodity prices, inflation, business activity changes) may distort intensity results.
- Volatile pricing may reduce usefulness for assessing absolute emissions performance.

6.5.3.4 Requirement for Accuracy

- Growth projections must be accurate for economic intensity targets to ensure sufficient absolute emissions reductions.

7. SCOPE 3 BOUNDARY, TARGET SETTING, AND REPORTING

7.1 Setting the Scope 3 Boundary

7.1.1 Organizations shall account for all Scope 3 emissions across their value chain, with any exclusions clearly disclosed and justified.

7.1.2 Scope 3 reporting shall cover the following greenhouse gases if present in the value chain:

- Carbon dioxide (CO_2)
- Methane (CH_4)
- Nitrous oxide (N_2O)
- Hydrofluorocarbons (HFCs)
- Perfluorocarbons (PFCs)
- Sulphur hexafluoride (SF_6)

7.1.3 Biogenic CO_2 emissions occurring within the value chain shall not be included in Scope 3 totals, but must be separately reported in the public disclosure.

7.2 Setting a GHG Target and Tracking Emissions Over Time

When setting targets or tracking performance, organizations shall:

7.2.1 Select a Scope 3 base year and provide justification for the chosen reference year.

7.2.2 Establish a base year recalculation policy defining the conditions under which recalculations will be applied.

7.2.3 Recalculate base year emissions whenever significant structural or methodological changes occur, such as mergers, acquisitions, divestitures, or updates to calculation approaches.

7.3 Reporting Requirements

Organizations shall publicly disclose the following information:

7.3.1 Scope 1 and Scope 2 emissions in conformance with the ICGHGS.

7.3.2 Total Scope 3 emissions, reported separately by category.

7.3.3 For each Scope 3 category:

(a) Total GHG emissions, expressed in metric tons of CO_2 equivalent, excluding biogenic CO_2 emissions and independent of any GHG trades (e.g., offsets or allowances).

(b) A list of included activities and categories.

(c) A list of excluded activities and categories, along with justifications for their exclusion.

(d) Any biogenic CO_2 emissions reported separately.

(e) A description of data types and sources used, including activity data, emission factors, and global warming potential (GWP) values.

(f) An assessment of data quality.

(g) A description of methodologies, allocation methods, and assumptions applied in calculations.

(h) The percentage of emissions calculated using data obtained directly from suppliers or other value chain partners.

7.4 Consolidation Approach

Organizations must apply a consistent consolidation approach when defining their Scope 1, Scope 2, and Scope 3 boundaries under the ICGHGS. The three recognized approaches are:

7.4.1 Equity Share

Under the equity share approach, organizations account for GHG emissions from operations in proportion to their equity ownership. The equity share reflects the organization's economic interest, representing the extent of rights to risks and rewards associated with the operation.

7.4.2 Financial Control

Under the financial control approach, organizations account for 100% of GHG emissions from operations over which they have financial control. Emissions from operations in which the organization has equity ownership but lacks financial control are excluded.

7.4.3 Operational Control

Under the operational control approach, organizations account for 100% of GHG emissions from operations over which they have operational authority. Emissions from operations in which the organization has equity ownership but lacks operational control are excluded.

7.5 Ambition Ranges for Target Classifications of Near-Term Science-Based Targets

7.5.1 Cross-Sector Absolute Reduction Method with 1.5°C Long-Term Temperature Goal for Scopes 1 and 2

- Absolute reduction target (Scope 1, 2):
  - If Base year ≤ 2020: 4.2% × (Target year – Base year)
  - If Base year > 2020: 4.2% × (Target year – 2020)

7.5.2 Cross-Sector Absolute Reduction Method with Well-Below 2°C Long-Term Temperature Goal for Scope 3

- Absolute reduction target (Scope 3):
  - If Base year ≤ 2020: 2.5% × (Target year – Base year)
  - If Base year > 2020: 2.5% × (Target year – 2020)

7.5.3 Economic Intensity Reduction Method with Well-Below 2°C Long-Term Temperature Goal for Scope 3

- Economic intensity target (Scope 3):
  - If Base year ≤ 2020: 100% – (93%)^(Target year – Base year)
  - If Base year > 2020: 100% – (93%)^(Target year – 2020)

7.5.4 Physical Intensity Reduction Method with Well-Below 2°C Long-Term Temperature Goal for Scope 3

- Physical intensity target (Scope 3):
  - If Base year ≤ 2020: 100% – (93%)^(Target year – Base year)
  - If Base year > 2020: 100% – (93%)^(Target year – 2020)

8. GREENHOUSE GAS EMISSION SOURCES AND BOUNDARIES

Scope 1 and Scope 2 emissions represent the core, reportable greenhouse gas emissions of an organization. Scope 1 covers all direct emissions from owned or controlled sources, while Scope 2 accounts for indirect emissions from purchased electricity, steam, heating, and cooling consumed by the organization. Upstream Scope 3 emissions include all indirect emissions (other than Scope 2) from purchased or acquired goods and services used by the organization in its operations. Categories include:

1. Purchased goods and services
2. Capital goods
3. Fuel- and energy-related activities (not included in Scope 1 or Scope 2)
4. Upstream transportation and distribution
5. Waste generated in operations
6. Business travel
7. Employee commuting
8. Upstream leased assets

8.1 Categories and Minimum Boundaries

8.1.1 Category 1 – Purchased Goods and Services

Description:

Extraction, production, and transportation of goods and services purchased or acquired by the reporting organization in the reporting year, not otherwise included in Categories 2–8.

Minimum Boundary:

All upstream (cradle-to-gate) emissions of purchased goods and services.

8.1.2 Category 2 – Capital Goods

Description:

Extraction, production, and transportation of capital goods purchased or acquired by the reporting organization in the reporting year.

Minimum Boundary:

All upstream (cradle-to-gate) emissions of purchased capital goods.

8.1.3 Category 3 – Fuel- and Energy-Related Activities (Not Included in Scope 1 or Scope 2)

Description:

Emissions related to the extraction, production, and transportation of fuels and energy purchased and consumed by the reporting organization that are not already included in Scope 1 or Scope 2.

Minimum Boundary:

All upstream (well-to-tank) emissions associated with purchased fuels and energy inputs.

8.1.4 Upstream transportation and distribution

Accounting for emissions from the transportation and distribution of products purchased by the reporting company, in the reporting year, between a company's tier-1 suppliers and its own operations (in vehicles and facilities not owned or controlled by the reporting company).

8.1.4.1 Description

8.1.4.1.1 Includes transportation by land, air, sea, and third-party logistics providers.

8.1.4.1.2 Covers emissions from warehousing operations not owned or controlled by the company.

8.1.4.1.3 Transportation and distribution may occur in several stages of the value chain and should be reported separately for clarity.

8.1.4.2 Boundary

8.1.4.2.1 Excludes emissions from transportation and distribution paid for directly by the reporting company (which fall under Scope 1 or Scope 2).

8.1.4.2.2 Includes only emissions upstream of the company's operations; downstream emissions are reported separately under Category 9.

8.1.4.3 Examples

8.1.4.3.1 Emissions from shipping raw materials from suppliers to the reporting company's facilities.

8.1.4.3.2 Emissions from outsourced third-party logistics providers delivering semi-finished products.

8.1.4.3.3 Energy consumed in distribution warehouses operated by third parties.

8.1.5 Transportation and distribution (upstream)

8.1.5.1 Transportation and distribution of products purchased by the reporting company in the reporting year between a company's tier 1 suppliers and its own operations (in vehicles and facilities not owned or controlled by the reporting company)

8.1.5.2 Transportation and distribution services purchased by the reporting company in the reporting year, including inbound logistics, outbound logistics (e.g., of sold products), and transportation and distribution between a company's own facilities (in vehicles and facilities not owned or controlled by the reporting company)

8.1.5.3 The scope 1 and scope 2 emissions of transportation and distribution providers that occur during use of vehicles and facilities (e.g., from energy use)

8.1.5.4 (Optional) The life cycle emissions associated with manufacturing vehicles, facilities, or infrastructure

8.1.6 Waste generated in operations

8.1.6.1 Disposal and treatment of waste generated in the reporting company's operations in the reporting year (in facilities not owned or controlled by the reporting company)

8.1.6.2 The scope 1 and scope 2 emissions of waste management suppliers that occur during disposal or treatment

8.1.6.3 (Optional) Emissions from transportation of waste

8.1.7 Business travel

8.1.7.1 Transportation of employees for business-related activities during the reporting year (in vehicles not owned or operated by the reporting company)

8.1.7.2 The scope 1 and scope 2 emissions of transportation carriers that occur during use of vehicles (e.g., from energy use)

8.1.7.3 (Optional) The life cycle emissions associated with manufacturing vehicles or infrastructure

8.1.8 Employee commuting

8.1.8.1 Transportation of employees between their homes and their worksites during the reporting year (in vehicles not owned or operated by the reporting company)

8.1.8.2 The scope 1 and scope 2 emissions of employees and transportation providers that occur during use of vehicles (e.g., from energy use)

8.1.8.3 (Optional) Emissions from employee teleworking

8.1.9 Upstream leased assets

8.1.9.1 Operation of assets leased by the reporting company (lessee) in the reporting year and not included in Scope 1 and Scope 2 — reported by lessee.

8.1.9.2 The Scope 1 and Scope 2 emissions of lessors that occur during the reporting company's operation of leased assets (e.g., from energy use).

8.1.9.3 *(Optional)* The life cycle emissions associated with manufacturing or constructing leased assets.

8.2 Scope 1 Emissions (Direct GHG Emissions)

Definition

Scope 1 emissions are **direct greenhouse gas (GHG) emissions** that occur from sources owned or controlled by the company. These emissions arise from activities such as fuel combustion in stationary and mobile equipment, process-related activities, and fugitive emissions.

8.2.1 Categories of Scope 1 Emissions

8.2.1.1 Stationary Combustion

- Emissions from boilers, furnaces, turbines, and generators using fuels like coal, natural gas, diesel, or biomass.
- Requires metered fuel consumption records or supplier invoices.
- Calculation methodology:

  CO_2 Emissions=Fuel Consumed×Net Calorific Value (NCV)×Carbon Content (CC)×Oxidation Factor (OF)×44/12

8.2.1.2 Mobile Combustion

- Emissions from company-owned or leased vehicles, ships, or aircraft.
- Activity data: Liters of fuel consumed or kilometers traveled.

- Requires differentiation by vehicle type, engine efficiency, and fuel blend.
- Formula:

  Emissions (tCO_2e)=∑(Distance Travelled×Fuel Economy×Emission Factor)

8.2.1.3 Process Emissions

- Industrial emissions from **chemical and physical processes**, e.g., calcination in cement manufacturing, ammonia production, aluminum smelting.
- Requires process-specific emission factors and material throughput data.
- General formula:

  Emissions (tCO_2e)=Activity Data×Emission Factor×44/12 (if CH_4/N_2O converted to CO_2e)

8.2.1.4 Fugitive Emissions

- Leaks from refrigeration and air conditioning equipment (**HFCs, PFCs**), methane leaks from pipelines, **SF_6** from electrical equipment.
- Data sources: Maintenance logs, gas purchase records, leakage estimates.
- Formula:Emissions (tCO_2e)=Refrigerant Leakage (kg)×GWP of Refrigerant

8.2.2 Measurement and Data Collection

- **Direct measurement** via flow meters, fuel meters, or continuous emissions monitoring systems (CEMS).
- **Indirect estimation** using purchase invoices, operating hours, or activity logs.
- Use IPCC default emission factors or country-specific factors for accuracy.

8.2.3 Reporting Requirements for Scope 1

- Report emissions in metric tons of CO_2-equivalent (tCO_2e).
- Apply **Global Warming Potential (GWP)** factors from the latest IPCC Assessment Report.
- Disaggregate data by **emission source category** (stationary, mobile, process, fugitive).

8.3 Scope 2 Emissions (Indirect GHG Emissions from Energy)

Definition

Scope 2 emissions are **indirect GHG emissions** from the generation of purchased or acquired electricity, steam, heat, or cooling consumed by the reporting company. While the emissions occur at the site of generation, they are attributed to the company based on its consumption.

8.3.1 Categories of Scope 2 Emissions

8.3.1.1 Purchased Electricity

- Emissions from electricity purchased from the grid or third-party suppliers.
- Calculated using grid-specific emission factors (location-based) or supplier-specific factors (market-based).
- Formula:

Emissions (tCO_2e)=Electricity Consumed (MWh)×Emission Factor (tCO_2e/MWh)

8.3.1.2 Purchased Steam, Heat, and Cooling

- Indirect emissions from thermal energy purchased from district heating/cooling systems or third-party utilities.
- Requires **energy bills** and **supplier disclosures** of emission intensity.
- Formula:

  Emissions (tCO_2e) = Steam/Heat Consumed (GJ)×Emission Factor (tCO_2e/GJ)

8.3.2 Calculation Approaches

Location-Based Method

- Uses **average grid emission factors** for the region where the energy is consumed.
- Data sources: IEA, national GHG inventories, or local grid operator data.
- Formula:

  Emissions=Electricity Consumed×Grid Average Emission Factor

Market-Based Method

- Uses emission factors based on **contractual instruments** such as Renewable Energy Certificates (RECs), Guarantees of Origin (GOs), or supplier-specific emissions data.
- Companies must disclose both location-based and market-based emissions.
- Formula:

  Emissions=Electricity Consumed×Supplier Emission Factor

8.3.3 Measurement and Data Collection

- Utility invoices, metering systems, or energy management software.
- Renewable energy contracts and certificates (if applicable).
- Standardized **conversion factors** to translate kWh, MWh, GJ into emissions (kg CO_2e).

8.3.4 Reporting Requirements for Scope 2

- Report emissions in **tCO_2e**, broken down by energy source type.
- Mandatory disclosure of both location-based and market-based Scope 2 emissions.
- Document contractual instruments (e.g., PPAs, RECs) to avoid **double-counting**.
- Apply consistent methodologies across reporting periods to ensure comparability.

8.4 Global Warming Potential (GWP) Conversion

When calculating total GHGs, CH_4, N_2O, and other gases must be converted into CO_2e using **IPCC Global Warming Potentials**:

Emissions (tCO_2e)=Mass of Gas (tonnes)×GWP of Gas

- CO_2 = 1
- CH_4 = 27–30 (AR6)
- N_2O = 273 (AR6)
- HFCs, PFCs, SF_6, NF_3 = Hundreds to tens of thousands GWP values.

9. DOWNSTREAM SCOPE 3 EMISSIONS

Downstream Scope 3 emissions represent the indirect greenhouse gas impacts that occur after a company's products or services leave its control, primarily during distribution, use, and end-of-life treatment. These emissions reflect how products are transported, consumed, and disposed of, providing a complete picture of an organization's value chain footprint. Categories included in downstream emissions are:

9. Downstream transportation and distribution
10. Processing of sold products
11. Use of sold products
12. End-of-life treatment of sold products
13. Downstream leased assets
14. Franchises
15. Investments

9.1 Category 9 — Downstream transportation and distribution

9.1.1 Category description

9.1.1.1 Transportation and distribution of products sold by the reporting company in the reporting year between the reporting company's operations and the end consumer (if not paid for by the reporting company), including retail and storage (in vehicles and facilities not owned or controlled by the reporting company).

9.1.2 Minimum boundary

9.1.2.1 The Scope 1 and Scope 2 emissions of transportation providers, distributors, and retailers that occur during use of vehicles and facilities (e.g., from energy use).

9.1.2.2 (Optional) The life cycle emissions associated with manufacturing vehicles, facilities, or infrastructure.

9.2 Processing of Sold Products

9.2.1 Processing of intermediate products sold in the reporting year by downstream companies (e.g., manufacturers)

9.2.2 The Scope 1 and Scope 2 emissions of downstream companies that occur during processing (e.g., from energy use)

9.3 Use of Sold Products

9.3.1 End use of goods and services sold by the reporting company in the reporting year

9.3.2 The direct use-phase emissions of sold products over their expected lifetime (i.e., the Scope 1 and Scope 2 emissions of end users that occur from the use of:

- products that directly consume energy (fuels or electricity) during use
- fuels and feedstocks
- GHGs and products that contain or form GHGs that are emitted during use)

9.3.3 (Optional) The indirect use-phase emissions of sold products over their expected lifetime (i.e., emissions from the use of products that indirectly consume energy (fuels or electricity) during use)

9.4 End-of-Life Treatment of Sold Products

9.4.1 Waste disposal and treatment of products sold by the reporting company (in the reporting year) at the end of their life

9.4.2 The Scope 1 and Scope 2 emissions of waste management companies that occur during disposal or treatment of sold products

9.5 Downstream Leased Assets

9.5.1 Operation of assets owned by the reporting company (lessor) and leased to other entities in the reporting year, not included in Scope 1 and Scope 2 – reported by lessor

9.5.2 The Scope 1 and Scope 2 emissions of lessees that occur during operation of leased assets (e.g., from energy use)

9.5.3 (Optional) The life cycle emissions associated with manufacturing or constructing leased assets

9.6. Downstream Activities

9.6.1 Franchises

- Operation of franchises in the reporting year, not included in scope 1 and scope 2 – reported by franchisor.
- The scope 1 and scope 2 emissions of franchisees that occur during operation of franchises (e.g., from energy use).
- Optional: The life cycle emissions associated with manufacturing or constructing franchises.

9.6.2 Investments

- Operation of investments (including equity and debt investments and project finance) in the reporting year, not included in scope 1 or scope 2.
- The reporting company accounts for its share of scope 1 and scope 2 emissions of investees, based on the proportional share of investment.
- Applies to categories such as:
  - Equity investments (operational control, financial control, or proportional share approaches).
  - Debt investments and project finance (depending on reporting boundaries and influence).
- Optional: Reporting scope 3 emissions of investees (if material and relevant to the company's value chain).

10. PURCHASED GOODS AND SERVICES

10.1 Categories of Procurement

A company's purchases can be divided into two types:

- Production-related procurement
- Non-production-related procurement

10.1.1 Production-related Procurement (Direct Procurement)

- Purchased goods directly related to the production of a company's products, including:
- Intermediate goods (e.g., materials, components, and parts) that the company purchases to process, transform, or include in another product.
- Final goods purchased for resale (for retail and distribution companies only).
- Capital goods (e.g., plant, property, and equipment) that the company uses to manufacture a product, provide a service, or sell, store, and deliver merchandise.

10.1.2 Non-production-related Procurement (Indirect Procurement)

- Purchased goods and services that are not integral to the company's products, but are instead used to enable operations. This may also include some capital goods (e.g., furniture, office equipment, computers). Examples include:
- Operations resource management: Products used in office settings such as office supplies, office furniture, computers, telephones, travel services, IT support, outsourced administrative functions, consulting services, and janitorial and landscaping services.
- Maintenance, repairs, and operations: Products used in manufacturing settings, such as spare parts and replacement parts.

10.2 Classification of Goods

10.2.1 Intermediate Products

- Inputs to the production of other goods or services that require further processing, transformation, or inclusion in another product before use by the end consumer.
- Not consumed by the end user in their current form.

10.2.2 Final Products

- Goods and services consumed by the end user in their current form, without further processing or transformation.
- Examples:
  - Products consumed by end consumers.
  - Products sold to retailers for resale to end consumers (e.g., consumer products).
  - Products consumed by businesses in their current form (e.g., office supplies).

10.2.3 Capital Goods

Final goods not immediately consumed or further processed, but used in their current form to manufacture a product, provide a service, or sell, store, and deliver merchandise. Scope 3 emissions from capital goods are reported in category 2 (Capital Goods), not in category 1 (Purchased Goods and Services).

10.3 Distinguishing Between Intermediate and Capital Goods

Both intermediate goods and capital goods are inputs to a company's operations. The classification depends on usage:

- If an electrical motor is included in another product (e.g., a motor vehicle), it is an intermediate good.
- If an electrical motor is used to produce other goods, it is a capital good consumed by the reporting company.

11. BOUNDARY REQUIREMENTS

Companies shall account for all Scope 3 emissions as defined in this standard, and must disclose and justify any exclusions.

- Emissions shall be accounted for from each Scope 3 category.
- Companies may include optional activities within each category.
- Scope 3 accounting must cover the following GHGs if emitted in the value chain:
  - Carbon dioxide (CO_2)
  - Methane (CH_4)
  - Nitrous oxide (N_2O)

- Hydrofluorocarbons (HFCs)
- Perfluorocarbons (PFCs)
- Sulphur hexafluoride (SF_6)

Companies may exclude Scope 3 activities only if the exclusion is disclosed and justified.

11.1 Criteria for Determining Relevance

11.1.1 Size

Activities contribute significantly to the company's total anticipated scope 3 emissions.

11.1.2 Influence

There are potential emissions reductions that could be undertaken or influenced by the company.

11.1.3 Risk

Activities contribute to the company's risk exposure (e.g., climate change-related risks such as financial, regulatory, supply chain, product and customer, litigation, and reputational risks).

11.1.4 Stakeholders

Activities are deemed critical by key stakeholders (e.g., customers, suppliers, investors, or civil society).

11.1.5 Outsourcing

Outsourced activities previously performed in-house. Alternatively, they are activities outsourced by the reporting company that are typically performed in-house by other companies in the same sector.

11.1.6 Sector guidance

They have been identified as significant by sector-specific guidance.

11.1.7 Other

They meet any additional criteria for determining relevance developed by the company or industry sector.

11.2 Inventory Scope and Targets

11.2.1 Scopes 1 and 2

11.2.1.1 Near-term targets: 95% minimum coverage

11.2.1.2 Long-term targets: To be set by reporting company

11.2.2 Scope 3

11.2.2.1 Near-term targets: 67% minimum coverage (if scope 3 emissions are at least 40% of total)

11.2.2.2 Long-term targets: 90% minimum coverage (all companies, to be set by reporting company)

11.2.3 Special Boundary Coverage Requirements by Emissions Source

11.2.3.1 Use-phase emissions from sold or distributed fossil fuels

11.2.3.1.1 Near-term targets: Must be covered by a separate absolute reduction target

11.2.3.1.2 Long-term targets: To be set by reporting company

11.2.3.2 Direct CO_2 emissions from biomass combustion, processing and distribution, as well as land-use emissions and carbon

11.2.3.2.1 Near-term targets: Must be included in target boundary

11.2.3.2.2 Long-term targets: To be set by reporting company

12.ADDRESSING DOUBLE COUNTING OF SCOPE 3 REDUCTIONS AMONG MULTIPLE ENTITIES IN A VALUE CHAIN

12.1 Definition and Challenges

12.1.1 Scope 3 emissions are the direct emissions of another entity.

12.1.2 Multiple entities in a value chain (e.g., suppliers, manufacturers, distributors, retailers, consumers) influence both emissions and reductions, making it difficult to attribute changes to a single entity.

12.2 Double Counting or Double Claiming

12.2.1 Occurs when two or more companies claim ownership for the same GHG reduction within the same scope.

12.2.2 The ICGHGS defines Scope 1 and Scope 2 to prevent double counting within those scopes.

12.2.3 Proper accounting of Scope 1, Scope 2, and Scope 3 avoids duplication within Scopes 1 and 2.

12.3 Double Counting Within Scope 3

12.3.1 Occurs when two entities in the same value chain account for Scope 3 emissions from a single source (e.g., both a manufacturer and retailer accounting for third-party transportation emissions).

12.3.2 This type of double counting is inherent and acceptable in Scope 3 accounting.

12.3.3 Scope 3 accounting enables multiple entities to act simultaneously to reduce emissions across the value chain.

12.3.4 Scope 3 emissions should not be aggregated across companies to estimate total emissions in a region.

12.3.5 A single emission may be accounted for in different Scope 3 categories by different companies.

12.4 Acceptability and Reporting Considerations

12.4.1 Double counting within Scope 3 can be acceptable for reporting, stakeholder communication, and progress tracking toward reduction targets.

12.4.2 Companies should acknowledge potential double counting when reporting reductions or credits.

12.4.3 Claims should emphasize joint efforts with partners rather than exclusive ownership of reductions.

13. APPROACHES TO DATA COLLECTION

13.1 Methodology Protocol

Description of the measurement methodology to be used. This includes:

13.1.1 Components and Reference Conditions

Identify the components to be measured and associated reference conditions.

13.1.2 Sampling Methods

Methods to ensure representative samples reflecting the source category and measurement objective.

13.1.3 Standard Techniques

Identification of any standard measurement techniques to be used.

13.1.4 Analytical Equipment and Operational Requirements

Equipment needed and operational requirements.

13.1.5 Access Requirements

Any source/sink or installation access requirements.

13.1.6 Accuracy, Precision, and Uncertainty

Any accuracy, precision, or uncertainty requirements.

13.1.7 Data Capture

Data capture requirements to be met.

13.1.8 QA/QC Regimes

Quality assurance and quality control procedures to be followed.

13.2 Measurement Plan

Measurement plan specifying how measurements should be carried out:

13.2.1 Sampling Points and Frequency

Number of sampling points for each parameter and selection method.

Number of individual measurements to be made for each point and condition set.

13.2.2 Timing and Reporting

Measurement dates and periods.

Reporting arrangements.

13.2.3 Additional Data Collection

Other process-related information required to interpret measurements.

13.2.4 Conditions and Personnel

Conditions or range of source conditions to be met.

Personnel responsible, other involved parties, and resources required.

13.3 Data Processing and Reporting

Procedures for processing and reporting data:

13.3.1 Reporting Procedures

Procedures to form an account of measurements, objectives, and plan.

13.3.2 Documentation and Traceability

Documentation to trace results back to collected data and operating conditions.

13.4 Gaps in Data Sets

Approaches to address missing or inconsistent data:

13.4.1 Filling Gaps in Periodic Data

Use interpolation/extrapolation to create complete annual estimates between periodic surveys.

13.4.2 Time Series Revision

Incorporate revised historical or recent data, integrating modelled assumptions.

13.4.3 Incorporating Improved Data

Use higher-tier measurement programs while accounting for inconsistencies with historical data.

13.4.4 Compensating for Deteriorating Data

Use splicing or alternative international data sources to address reduced data quality.

13.4.5 Incomplete Coverage

Combine partial datasets with surrogate or expert judgment to generate national totals.

13.5 Qualitative Criteria to Identify Key Categories

When quantitative key category analysis is incomplete:

13.5.1 Mitigation Techniques and Technologies

Prioritize categories where emissions decreased or removals increased due to mitigation.

13.5.2 Expected Growth

Prioritize categories likely to increase emissions or decrease removals in the future.

13.5.3 No Quantitative Assessment of Uncertainties Performed

Prioritize categories with high potential contribution to overall inventory uncertainty.

13.5.4 Completeness

Consider categories not yet estimated quantitatively; use comparable national inventories to identify potential key categories.

14.GREENHOUSE GAS EMISSIONS INVENTORY AND SUPPLIER DATA REPORTING

14.1 Total Annual Scope 1 and 2 Emissions

14.1.1 Emissions Breakdown

Scope 1 and 2 emissions broken down by sources (e.g., fuel types).

14.1.2 Exclusions

Any emission sources excluded from the quantities reported.

14.1.3 Intensity Metrics

Scope 1 and 2 emissions intensity (per selected unit or currency).

14.1.4 Customer Allocation

Scope 1 and 2 emissions allocated/apportioned to the customer.

14.1.5 Methodologies

Description of methodologies followed in calculating scope 1 and 2.

14.1.6 Product-Level Data

Any product-level Life-Cycle Assessment (LCA) data, if available.

14.2 Total Scope 3 Emissions

14.2.1 Emissions Breakdown

Scope 3 emissions broken down by category.

14.2.2 Exclusions

Any emission sources excluded from the quantities reported across categories.

14.2.3 Intensity Metrics

Scope 3 emissions intensity (per selected unit or currency).

14.2.4 Customer Allocation

Scope 3 emissions allocated/apportioned to the customer.

14.2.5 Methodologies

Description of methodologies followed in calculating scope 3 categories.

14.2.6 Verification

Which portion of emissions have been third-party verified, if any.

14.3 Key Considerations for Target Progress Monitoring and Reporting

14.3.1 Methodologies and Data Sources

Report on methodologies, assumptions, and data sources used for tracking annual performance against targets.

14.3.2 Supplier List Management

Define a systematic and auditable process for updating and maintaining supplier list data.

14.3.3 Annual Inventory Refresh

Refresh scope 3 inventory and related supplier data annually over the target timeframe.

14.3.4 Third-Party Verification

Consider third-party verification on scope 3 calculations that determine the targeted list of suppliers.

14.4 Supplier-Specific Emissions Calculation

14.4.1 Aspects of Supplier GHG Emissions to Consider CollectingKey considerations for collecting supplier emissions data include:

- Scope 1 and 2 emissions of tier 1 suppliers.
- Supplier-specific product emission factors (cradle-to-gate).
- Material inputs, transport distances, and waste outputs associated with purchased goods.

14.4.2 Calculation Formula Summary Tables

14.4.2.1 Category 1: Purchased Goods and Services

14.4.2.1.1 Supplier-specific method:

Emissions are calculated by summing across all purchased goods and services the product of the quantity of each good purchased and the supplier-specific emission factor for that good or service. Mathematically, this can be expressed as:

Emissions = Σ (quantity of good purchased × supplier-specific emission factor of purchased good or service)

14.4.2.1.1.1 Activity data needed include the quantities or units of goods or services purchased.

14.4.2.1.1.2 Emission factors are obtained from supplier-specific sources, such as a reliable cradle-to-gate GHG inventory, product footprint, or internal LCA report.

14.4.2.1.2 Hybrid method:The hybrid method is used when supplier-specific activity data is available for all activities associated with producing the purchased goods. Emissions are calculated by summing several components:

14.4.2.1.2.1 Tier 1 supplier emissions:Sum of scope 1 and 2 emissions of the tier 1 supplier relating to the purchased good or service.

14.4.2.1.2.2 Material input emissions:Sum across all material inputs of the purchased goods and services, calculated as: Σ (mass or quantity of material inputs used by tier 1 supplier × cradle-to-gate emission factor for the material)

14.4.2.1.2.3 Transport emissions: Sum across the transport of material inputs to the tier 1 supplier, calculated as:Σ (distance of transport of material inputs × mass or volume of material input × cradle-to-gate emission factor for the vehicle type)

14.4.2.1.2.4 Waste emissions:Sum across waste outputs by tier 1 supplier relating to purchased goods and services, calculated as: Σ (mass of waste from tier 1 supplier × emission factor for waste activity)

14.4.2.1.2.5 Other emissions: Include any other emissions emitted in the provision of the good or service as applicable.

14.4.2.1.2.6 Activity data needed for the hybrid method

Includes supplier scope 1 and 2 emissions, quantities of material inputs, transport distances, and waste amounts.

14.4.2.1.2.7 Emission factors required

Include cradle-to-gate factors for materials, transport, and waste, along with supplier-specific emissions.

14.4.2.1.3 Allocated supplier data and inputs:

This section covers the additional activity and emission data needed from suppliers for purchased goods:

14.4.2.1.3.1 Allocated scope 1 and 2 emissions

Emissions from electricity use, fuel use, and any process and fugitive emissions by the supplier relating to the good or service purchased by the reporting company.

14.4.2.1.3.2 Material inputs

Mass or quantity of material inputs (e.g., bill of materials) used by the supplier to produce purchased goods.

14.4.2.1.3.3 Fuel inputs

Mass or quantity of fuel inputs used by the supplier to produce purchased goods.

14.4.2.1.3.4 Transport of raw materials to supplier

Distance from the origin of the raw material inputs to the supplier. (Transport emissions from the supplier to the reporting company are calculated in category 4 and should not be included here.)

14.4.2.1.3.5 Waste outputs

Quantities of waste output by the supplier to produce purchased goods.

14.4.2.1.3.6 Other emissions

Other emissions emitted in the provision of the purchased goods, as applicable.

14.4.2.1.3.7 Activity data considerations

Depending on what activity data has been collected from the supplier, companies may need to collect:

- Cradle-to-gate emission factors for materials used by tier 1 supplier to produce purchased goods (either supplier-specific emission factors or industry average emission factors from secondary databases; preference is given to more specific and verified factors).
- Life cycle emission factors for fuel used by incoming transport of input materials to tier 1 supplier.
- Emission factors for waste outputs by tier 1 supplier.
- Other emission factors as applicable (e.g., process emissions).
- Secondary emission factors required will also depend on what data is available for the purchased good.

14.4.2.2 Hybrid and Average-Data Methods for Purchased Goods and Services

14.4.2.2.1 Hybrid method (allocated supplier data only)

Emissions are calculated by summing several components:

- Tier 1 supplier emissions: Sum of scope 1 and scope 2 emissions of the tier 1 supplier relating to the purchased good or service.

Emissions = Σ (scope 1 + scope 2 emissions of tier 1 supplier for purchased good or service)

- Waste emissions: Sum of waste outputs by tier 1 supplier, calculated as: Emissions = Σ (mass of waste from tier 1 supplier × emission factor for waste activity)
- Residual purchased good emissions: Sum across purchased goods or services for emissions excluding scope 1, scope 2, and waste:

Emissions = Σ (mass or quantity of purchased good × emission factor excluding scope 1, scope 2, and waste emissions)

- Activity data needed: allocated scope 1 and 2 emissions, mass of waste, quantities of purchased goods or services.

Emission factors needed: waste emission factors, cradle-to-gate emission factors for purchased goods excluding supplier scope 1/2/waste.

14.4.2.2.2 Average-data method

Emissions are calculated using average emission factors per unit of product or mass:

Emissions = Σ (mass of purchased good × emission factor per kg)

or

Emissions = Σ (units of purchased good × emission factor per unit)

Activity data needed: mass or number of units of purchased goods or services for the year.

Emission factors needed: cradle-to-gate emission factors per unit of mass or product.

14.4.2.2.3 Spend-based method

Emissions are calculated using monetary value of purchases and emission factors per economic unit:

Emissions = Σ (value of purchased good × emission factor per $)

Activity data needed: amount spent on purchased goods or services by product type.

Emission factors needed: cradle-to-gate emission factors per unit of economic value.

14.4.2.3 Supplier-specific method for Capital Goods

Emissions are calculated by summing across capital goods: Emissions = Σ (quantities of capital good purchased × supplier-specific emission factor of capital good)

Activity data needed: quantities of capital goods purchased.

Emission factors needed: supplier-specific product emission factors for capital goods.

14.4.2.4 Hybrid method for Capital Goods

Emissions are calculated by summing several components:

- Tier 1 supplier emissions: Sum of scope 1 and 2 emissions of the tier 1 supplier relating to the purchased capital good.
  Emissions = Σ (scope 1 + scope 2 emissions of tier 1 supplier for capital good)
- Material input emissions: Sum across all material inputs of the capital goods, calculated as: Emissions = Σ (mass or quantity of material inputs used by tier 1 supplier × cradle-to-gate emission factor for the material)
- Transport emissions: Sum across the transport of material inputs to the tier 1 supplier, calculated as:
  Emissions = Σ (distance of transport of material inputs × mass or volume of material input × cradle-to-gate emission factor for the vehicle type)
- Waste emissions: Sum across waste outputs by tier 1 supplier relating to the capital good, calculated as:
  Emissions = Σ (mass of waste from tier 1 supplier × emission factor for waste activity)
- Other emissions: Include any other emissions emitted in the provision of the capital good as applicable.
- Activity data needed: allocated scope 1 and 2 emissions, mass or quantity of material inputs, fuel inputs, transport distances, waste amounts, and other applicable emissions. Emission factors needed: cradle-to-gate factors for materials, transport, and waste, along with supplier-specific emission factors.

  14.4.2.4.1 Supplier-allocated data for Capital Goods

  Emissions are calculated using allocated scope 1 and 2 emissions and supplier-provided activity data:
- Allocated scope 1 and 2 emissions: Includes electricity use, fuel use, and any process or fugitive emissions for the purchased capital good.
- Material input emissions: Mass or quantity of material inputs used by supplier to produce capital goods.
- Fuel emissions: Mass or quantity of fuel inputs used by supplier to produce capital goods.
- Transport emissions to supplier: Distance from the origin of raw material inputs to the supplier. *(Note: transport from supplier to reporting company is calculated separately in Category 4.)*
- Waste emissions: Quantities of waste output by supplier to produce capital goods.
- Other emissions: Any additional emissions emitted in provision of the capital goods.
- Activity data needed: allocated supplier emissions, material and fuel quantities, transport distances, waste amounts, and other relevant emissions. Emission factors needed: cradle-to-gate emission factors for materials, fuel, waste, and other applicable emissions.

14.4.2.5 Additional Activity Data and Emission Factors for Capital Goods

Depending on the activity data collected from the supplier, companies may need to obtain the following:

- Cradle-to-gate emission factors for materials used by tier 1 suppliers to produce capital goods. These can be supplier-specific or industry-average emission factors from secondary databases, with preference for verified and specific factors.
- Life-cycle emission factors for fuel used in the incoming transport of input materials to tier 1 suppliers.
- Emission factors for waste outputs generated by tier 1 suppliers in the production of capital goods.
- Other emission factors as applicable, such as process emissions.
- Secondary emission factors depend on the available data for the capital good. Companies may need to collect either:
  - Cradle-to-gate emission factors of the capital goods per unit of mass or product (e.g., kg CO2e/kg), or
  - Cradle-to-gate emission factors of the capital goods per unit of economic value (e.g., kg CO2e/$).

14.4.2.5.1 Hybrid Method (Allocated Scope 1 and 2 Emissions Only)

Emissions are calculated as the sum of:

- Tier 1 supplier emissions: Emissions = Σ (scope 1 + scope 2 emissions of tier 1 supplier for capital good)
- Waste emissions: Emissions = Σ (mass of waste from tier 1 supplier × emission factor for waste activity)
- Capital good emissions excluding scope 1, scope 2, and waste: Emissions = Σ (mass or quantity of capital good × emission factor of capital good per unit or $)

Activity data needed: allocated supplier emissions, waste amounts, mass/quantity of capital goods.

Emission factors needed: supplier-specific or industry-average factors for capital goods and waste.

14.4.2.5.2 Average-Data Method

Emissions are calculated as:

- By mass:Emissions = Σ (mass of capital good × emission factor per unit of mass)
- By units:Emissions = Σ (number of units × emission factor per reference unit)

Activity data needed: mass or number of units of capital goods.

Emission factors needed: cradle-to-gate emission factors per unit mass or product.

14.4.2.5.3 Spend-Based Method

Emissions are calculated as: Emissions = Σ (value of capital good × emission factor per unit of economic value)

Activity data needed: amount spent on capital goods by product type.

Emission factors needed: cradle-to-gate emission factors per unit economic value (kg CO2e/$).

14.4.3 Fuel- and Energy-Related Activities Not Included in Scope 1 or Scope 2 (Category 3)

14.4.3.1 Upstream Emissions of Purchased Fuels

- Supplier-specific method:Emissions are calculated as: Emissions = Σ (fuel consumed × upstream fuel emission factor) where upstream fuel emission factor = life cycle emission factor – combustion emission factor
- Activity data needed: quantities and types of fuel consumed. Emission factors needed:
- Supplier-specific emission factors for extraction, production, and transportation per unit of fuel consumed (kg CO2e/kWh), by fuel type and region.
- Average emission factors for upstream emissions per unit of fuel (kg CO2e/kWh).

14.4.3.2 Upstream Emissions of Purchased Electricity

- Supplier-specific or average-data method: Emissions are calculated as: Emissions = Σ (electricity consumed × upstream electricity emission factor)
- Σ (steam consumed × upstream steam emission factor)
- Σ (heating consumed × upstream heating emission factor)
- Σ (cooling consumed × upstream cooling emission factor) where upstream emission factor = life cycle emission factor – combustion emissions factor – T&D losses
- Activity data needed: total quantities of electricity, steam, heating, or cooling purchased and consumed per unit (e.g., MWh), broken down by supplier, grid region, or country. Emission factors needed:
- Utility-specific emission factors for extraction, production, and transport of fuels consumed per MWh.
- Grid-region, country, or regional average emission factors for upstream energy.

14.4.3.3 Transmission and Distribution (T&D) Losses

- Supplier-specific or average-data method: Emissions are calculated as: Emissions = Σ (electricity consumed × electricity life cycle emission factor × T&D loss rate)
- Σ (steam consumed × steam life cycle emission factor × T&D loss rate)
- Σ (heating consumed × heating life cycle emission factor × T&D loss rate)
- Σ (cooling consumed × cooling life cycle emission factor × T&D loss rate)
- Activity data needed: electricity, steam, heating, or cooling consumption per unit (e.g., MWh), broken down by grid region or country; and/or Scope 2 emissions data.
  Emission factors needed:
- Utility-specific T&D loss rates for the relevant grid.
- Country, regional, or global average T&D loss rates.

14.4.3.4 Generation of Purchased Electricity Sold to End Users

- Supplier-specific or average-data method:
  Emissions are calculated as: Emissions = Σ (electricity purchased for resale × electricity life cycle emission factor)
- Σ (steam purchased for resale × steam life cycle emission factor)=
- Σ (heating purchased for resale × heating life cycle emission factor)
- Σ (cooling purchased for resale × cooling life cycle emission factor)

Activity data needed: quantities and source of electricity, steam, heating, or cooling purchased and re-sold. Emission factors needed: supplier-specific or average cradle-to-gate emission factors per unit of energy sold.

14.4.4 Upstream Transportation and Distribution (Category 4)

14.4.4.1 Generation of Purchased Electricity for Resale – Supplier-Specific Data

- Supplier-specific method:
  Use specific emissions data for the generation unit from which the purchased power is generated.
- Average-data method:
  Use grid-average emission rate for the origin of purchased power.

14.4.4.2 Calculating Emissions from Transportation

- Fuel-based method:
  Emissions are calculated as: Emissions = Σ (quantity of fuel consumed × emission factor for fuel)
- Σ (quantity of electricity consumed × emission factor for electricity)
- Σ (quantity of refrigerant leakage × global warming potential of refrigerant)

If fuel data is unavailable, companies may calculate fuel consumption using:

a. From fuel spend:
   Fuel consumed = total fuel spend ÷ average fuel price
b. From distance travelled:
   Fuel consumed = Σ (total distance travelled × fuel efficiency of vehicle)

Allocated fuel use: Allocated fuel use = total fuel consumed × (mass/volume of company's goods ÷ mass/volume of goods transported)

Optional adjustment: Companies may use dimensional mass or chargeable mass where more appropriate.

Optional unladen backhaul emissions:

Emissions = Σ (fuel consumed from backhaul × fuel emission factor) where fuel consumed from backhaul = average efficiency of vehicles unladen × total distance travelled unladen

Activity data needed:

- Quantities of fuel consumed (diesel, gasoline, jet fuel, biofuels, etc.)

- Amount spent on fuel and average cost
- Amount of refrigerant leakage
- Distance travelled, if applicable
- Average fuel efficiency of vehicles
- Mass of goods transported
- Information on whether goods are refrigerated

Emission factors needed:

- Fuel emission factors (scope 1 and 2, optionally cradle-to-gate)
- Electricity emission factors for electric vehicles
- Refrigerant leakage emission factors

14.4.4.3 Distance-Based Method

- Distance-based method: Emissions are calculated as:Emissions = Σ (mass or volume of goods × distance travelled × emission factor of transport mode or vehicle type)

Activity data needed:

- Mass or volume of products transported
- Actual distances (from suppliers, maps, or published sources)

Emission factors needed:

- Emission factor per transport mode or vehicle type (kg CO2e/tonne-km or kg CO2e/volume-km)

14.4.4.4 Spend-Based Method

- Spend-based method: Emissions are calculated as: Emissions = Σ (amount spent on transportation × EEIO emission factor per unit of economic value)

Activity data needed:

Amount spent on transportation by type (road, rail, air, barge), using market values. Emission factors needed: Cradle-to-gate emission factors per unit of economic value for the transportation type (kg CO2e/$)

14.4.4.5 Site-Specific Method for Distribution and Storage

- Site-specific method: Emissions of each storage facility are calculated as: Emissions of storage facility (kg CO2e) = (fuel consumed × fuel emission factor)
- (electricity consumed × electricity emission factor)
- (quantity of refrigerant leakage × global warming potential of refrigerant)

Allocated emissions for the company's products: Allocated emissions of storage facility = (volume of company's purchased goods ÷ total volume of goods in storage facility) × emissions of storage facility

Total site-specific emissions: Total allocated emissions = Σ allocated emissions of all storage facilities

Activity data needed:

- Site-specific fuel and electricity use
- Site-specific refrigerant leakage
- Average occupancy rate of the storage facility (total volume of goods stored)

Emission factors needed:

- Site- or region-specific emission factors for energy sources (kg CO2e/kWh for electricity, kg CO2e/liter for diesel)
- Refrigerant emission factors for fugitive/process emissions (kg HFC/kg of refrigerant leakage)

14.4.4.6 Average-Data Method for Storage Facilities

- Average-data method: Emissions are calculated as: Emissions = Σ (volume of stored goods × average number of days stored × emission factor for storage facility)

Activity data needed:

- Volume of purchased goods stored (m^3, m^2, pallet, TEU)
- Average number of days goods are stored

Emission factors needed:

- Emission factor per unit stored (e.g., per pallet, m^2/m^3, or TEU/day)

14.5 Waste Generated in Operations (Category 5)

- Supplier-specific method: Emissions are calculated as: Emissions = Σ allocated scope 1 and 2 emissions of waste treatment company

Activity data needed:

- Allocated scope 1 and 2 emissions of the waste-treatment company (allocated to the waste collected from the reporting company)

14.6 Transportation and Emissions from Leased Transport Assets

14.6.1 Calculating Fuel Use from Fuel Spend

If fuel data is unavailable, emissions can be estimated using fuel spend: Fuel consumed = total fuel spend ÷ average fuel price

Activity data needed:

- Amount spent on fuel by type (e.g., diesel, gasoline, jet fuel, biofuels)
- Average cost of fuel per unit

Emission factors needed:

- Life cycle fuel emission factors (kg CO2e/liter, kg CO2e/Btu, etc.)
- For electric vehicles, electricity emission factors (kg CO2e/kWh)
- Fugitive emission factors for refrigerant leaks (kg CO2e/kg)

14.6.2 Calculating Fuel Use from Distance Travelled

Fuel consumed = Σ (total distance travelled × fuel efficiency of vehicle)

Optional additional emissions from accommodations: Σ (annual number of hotel nights × hotel emission factor)

Activity data needed:

- Distance travelled by each vehicle or transport type
- Average fuel efficiency of vehicles
- Annual number of hotel nights (if applicable)
- Fugitive emissions, e.g., refrigerant leakage

Emission factors needed:

- Life cycle fuel emission factors (kg CO2e/liter, kg CO2e/Btu, etc.)
- Electricity emission factors for electric vehicles (kg CO2e/kWh)
- Fugitive emission factors (kg CO2e/kg refrigerant leakage)

14.6.3 Distance-Based Method

Emissions = Σ (distance travelled by vehicle type × vehicle-specific emission factor)

Optional additional emissions: Σ (annual number of hotel nights × hotel emission factor)

Activity data needed:

- Total distance travelled for all employees, by mode of transport (air, train, bus, car, etc.)
- Countries of travel (to account for regional variation in emission factors)
- Specific vehicle types used

Emission factors needed:

- Vehicle-specific or mode-specific emission factors (kg CO2e/km or kg CO2e/passenger-km)
- For electric vehicles, electricity emission factors per km or passenger-km

14.7 Employee Commuting

14.7.1 Fuel-Based Method

Emissions from employee commuting can be calculated using fuel and energy consumption: Emissions = Σ (quantity of fuel consumed × emission factor for the fuel) + Σ (quantity of electricity consumed × emission factor for electricity grid) + Σ (quantity of refrigerant leakage × global warming potential for refrigerant)

If fuel data is unavailable, companies may use the following approaches:

14.7.1.1 Calculating Fuel Use from Fuel Spend

Fuel consumed = total fuel spend ÷ average fuel price

Activity data needed:

- Quantities of fuel consumed (diesel, gasoline, jet fuel, biofuels, etc.)
- Amount spent on fuel and average cost

Emission factors needed:

- Life cycle fuel emission factors (kg CO2e/liter, kg CO2e/Btu, etc.)
- Electricity emission factors for electric vehicles (kg CO2e/kWh)

14.7.1.2 Calculating Fuel Use from Distance Travelled

Fuel consumed = Σ (total distance travelled × fuel efficiency of vehicle)

Activity data needed:

- Distance travelled by each vehicle type
- Average fuel efficiency of the vehicle

Emission factors needed:

- Life cycle fuel emission factors (kg CO2e/liter, kg CO2e/Btu, etc.)
- Electricity emission factors for electric vehicles (kg CO2e/kWh)

14.7.2 Distance-Based Method

- Step 1: Total distance travelled by vehicle type
  Total distance travelled = Σ (daily one-way distance between home and work × 2 × number of commuting days per year)
- Step 2: Total emissions from employee commuting
  Emissions (kg CO2e) = Σ (total distance travelled by vehicle type × vehicle-specific emission factor)

  Optional additional emissions from teleworking: Σ (quantities of energy consumed × emission factor for energy source)

  Activity data needed:
  - Total distance travelled by each vehicle type for all employees
  - Number of commuting days per year
  - Teleworking energy consumption (if applicable)

  Emission factors needed:

- Vehicle-specific emission factors (kg CO2e/km or kg CO2e/passenger-km)
- Emission factors for electricity or other energy sources used in teleworking (kg CO2e/kWh)

14.7.3 Average-Data Method

Emissions from employee commuting can also be estimated using aggregated data on commuting patterns:

Emissions = Σ (total number of employees × % of employees using mode of transport × one-way commuting distance × 2 × working days per year × emission factor of transport mode)

Activity data needed:

- o Number of employees
- o Average distance travelled by an employee per day
- o Average breakdown of transport modes used by employees (e.g., train, subway, bus, car, bicycle)
- o Average number of working days per year

Emission factors needed:

- o Emission factors for each mode of transport (usually expressed as kg CO2e, or other greenhouse gases like CH4, N2O per passenger-kilometer traveled)

Notes:

- o Total distance travelled by employees over the reporting period should be calculated.
- o Mode-specific emission factors should reflect the greenhouse gases emitted per passenger-kilometer for each transport mode.

14.8 Summary of Calculation Methods for Category 8 (Upstream Leased Assets)

14.8.1 Asset-Specific Method

Emissions associated with each leased asset are calculated as follows:

- Scope 1 emissions of leased asset:
  Emissions = ∑ (quantity of fuel consumed × emission factor for fuel) + ∑ (quantity of refrigerant leakage × emission factor for refrigerant) + process emissions
- Scope 2 emissions of leased asset:
  Emissions = ∑ (quantity of electricity, steam, heating, cooling consumed × emission factor for energy source)

  Then, total emissions = ∑ scope 1 and scope 2 emissions across all leased assets

  For leased building spaces not sub-metered by the tenant, emissions can be allocated using: Energy use from leased space (kWh) × (reporting company's area ÷ building's total area) × building occupancy rate × building's total energy use (kWh)

Activity data needed:

- o Asset-specific fuel use, electricity, steam, heating, and cooling use
- o Process and fugitive emissions (e.g., refrigerant leakage)
- o Asset-specific scope 1 and scope 2 emissions data

Emission factors needed:

- o Site or regionally specific emission factors for energy sources (e.g., kg CO2e/kWh for electricity, kg CO2e/liter for diesel)
- o Emission factors of fugitive and process emissions

14.8.2 Lessor-Specific Method

Emissions are calculated for each lessor:

- Scope 1 emissions of lessor: Emissions = ∑ (quantity of fuel consumed × emission factor for fuel) + ∑ (quantity of refrigerant leakage × emission factor for refrigerant) + process emissions
- Scope 2 emissions of lessor: Emissions = ∑ (quantity of electricity, steam, heating, cooling consumed × emission factor for energy source)

  Total emissions from lessors are allocated and summed: Total emissions = ∑ scope 1 and scope 2 emissions of lessor × (area, volume, quantity of leased asset ÷ total area, volume, quantity of lessor assets)

Activity data needed:

- Lessor's fuel use, electricity use, process emissions, and fugitive emissions
- Physical or financial data for allocation (e.g., total area/volume/quantity of lessor's assets and leased assets)

Emission factors needed:

- Site or regionally specific emission factors for energy sources
- Emission factors of fugitive and process emissions

14.8.3 Average-Data Method

For building types: Emissions = ∑ (total floor space of building type × average emission factor for building type)

For leased assets other than buildings or where floor space data is unavailable: Emissions = ∑ (number of assets × average emissions per asset type)

Activity data needed:

- Floor space of each leased asset=
- Number of leased assets, by building type or asset type

Emission factors needed:

- Average emission factors by floor space (e.g., kg CO2e/m²/year)
- Average emission factors by building type (e.g., kg CO2e/building/year)
- Emission factors by asset type (e.g., kg CO2e/car/year)

14.9 Summary of Calculation Methods for Category 9 (Downstream Transportation and Distribution)

14.9.1 Fuel-Based Method

Emissions are calculated as: Emissions =∑ (quantity of fuel consumed × emission factor for the fuel)

- ∑ (quantity of electricity consumed × emission factor for electricity grid)
- ∑ (quantity of refrigerant leakage × global warming potential for refrigerant)

If fuel data is unavailable, the following alternatives may be used:

- Calculating Fuel Use from Fuel Spend: Fuel consumed = ∑ (total fuel spend ÷ average fuel price)
- Calculating Fuel Use from Distance Travelled: Fuel consumed = ∑ (total distance travelled × fuel efficiency of vehicle)
- Allocated Fuel Use: Allocated fuel = total fuel consumed × (mass or volume of company's goods ÷ mass or volume of goods transported)
- Optional CO2e emissions from unladen backhaul: Emissions = ∑ (quantity of fuel consumed from backhaul × emission factor for the fuel)

where:Quantity of fuel consumed from backhaul = average efficiency of vehicles unladen × total distance travelled unladen

Activity Data Needed:

- Quantities of fuel (diesel, gasoline, jet fuel, biofuels, etc.) consumed
- Amount spent on fuel and average cost
- Amount of refrigerant leakage
- Distance travelled (if applicable)
- Average fuel efficiency of vehicles (liters per tonne-km)
- Mass of purchased goods in the vehicle (tonnes)
- Information on refrigeration during transport

Emission Factors Needed:

- Fuel emission factors (kg CO2e per unit of energy consumed, e.g., liters or Btu)
- Electricity emission factors for electric vehicles (kg CO2e/kWh)
- Refrigerant leakage emission factors (kg CO2e/kg leakage)

Emission factors should include Scope 1 and Scope 2 emissions of the fuel and may optionally include cradle-to-gate emissions.

14.9.2 Distance-Based Method

Emissions =∑ (mass or volume of goods purchased × distance travelled in transport leg × emission factor of transport mode or vehicle type)

Activity Data Needed:

- Mass or volume of products sold
- Actual distances from transportation suppliers, online maps, or published port-to-port travel distances

Emission Factors Needed:

- Emission factor by transport mode (rail, air, road, sea) or vehicle type (articulated lorry, container vessel, etc.), expressed in kg CO2e/tonne-km or kg CO2e/volume-km

14.9.3 Spend-Based Method

Emissions = ∑ (amount spent on transportation by type × relevant EEIO emission factor per unit of economic value)

Activity Data Needed:

- Amount spent on transportation by type (road, rail, air, barge) using market values
- Inflation data to adjust market values between the year of the EEIO emission factors and the year of activity data

Emission Factors Needed:

- Cradle-to-gate emission factors per unit of economic value (kg CO2e/$)

14.9.4 Site-Specific Method for Storage Facilities

Emissions of storage facility (kg CO2e) = (fuel consumed × fuel emission factor) + (electricity consumed × electricity emission factor) + (refrigerant leakage × refrigerant emission factor)

Allocated emissions of storage facility = (volume of company's goods ÷ total volume of goods in facility) × emissions of storage facility

Total emissions = ∑ allocated emissions across all storage facilities

Activity Data Needed:

- Site-specific fuel and electricity consumption
- Site-specific refrigerant leakage
- Average occupancy rate of storage facility

Emission Factors Needed:

- Site or regional emission factors for energy sources per unit of consumption
- Fugitive and process emission factors for refrigerants (kg HFC/kg leakage)

14.9.5 Average-Data Method for Storage Facilities

Emissions =∑ (volume of stored goods × average number of days stored × emission factor per unit of storage)

Activity Data Needed:

- Volume of goods stored (m^3, m^2, pallets, or TEUs)
- Average number of days goods are stored
- Throughput-based data to enable per-unit emission calculation

Emission Factors Needed:

- Emission factor per pallet, per m^2/m^3, or per TEU stored in facility (kg CO2e/unit/day)

14.10 Summary of Calculation Methods for Category 10 (Processing of Sold Products)

14.10.1 Site-Specific Method

Emissions =∑ (fuel consumed × life cycle emission factor for fuel)

- ∑ (electricity consumed × life cycle emission factor for electricity)
- ∑ (refrigerant leakage × GWP for refrigerant)
- process emissions
- ∑ (mass of waste output × emission factor for waste activity)

Activity Data Needed:

- Types and quantities of intermediate goods sold
- Site-specific GHG emissions data from downstream value chain partners, or
- Site-specific activity data from downstream processes, including:
  - Quantities of energy consumed (electricity and fuels)
  - Mass of waste generated (if available)
  - Activity data for non-combustion emissions (industrial process or fugitive emissions)

Emission Factors Needed:

- Emission factors for fuels
- Emission factors for electricity
- Emission factors for waste outputs (if available)
- Emission factors for non-combustion emissions (if applicable)

14.10.2 Average-Data Method

Emissions = ∑ (mass of sold intermediate product × emission factor of processing per unit of final product)

Activity Data Needed:

- Types of sold intermediate products
- Process data for transforming sold intermediate products into usable final products
- Data for allocation (mass, economic value, etc.)

Emission Factors Needed:

- Average emission factors for downstream processes (kg CO2e/kg of product)
- Life cycle emission factors of sold or final products

14.11 Summary of Calculation Methods for Category 11 (Use of Sold Products)

14.11.1 Direct Use-Phase Emissions (Energy-Consuming Products)

Emissions =∑ (total lifetime expected uses × number sold × fuel consumed per use × emission factor for fuel)

- ∑ (total lifetime expected uses × number sold × electricity consumed per use × emission factor for electricity)
- ∑ (total lifetime expected uses × number sold × refrigerant leakage per use × GWP for refrigerant)

Activity Data Needed:

- Total lifetime expected uses of product(s)
- Quantities of products sold
- Fuel used per use
- Electricity consumed per use
- Refrigerant leakage per use

Emission Factors Needed:

- Emission factors for fuels
- Emission factors for electricity
- Emission factors for refrigerants

14.11.2 Fuels and Feedstocks

Emissions = ∑ (total quantity of fuel/feedstock sold × combustion emission factor for fuel/feedstock)

Activity Data Needed:

- Total quantities of fuels/feedstocks sold

Emission Factors Needed:

- Combustion emission factors for fuels/feedstocks

14.11.3 Greenhouse Gases Contained in Products

Emissions = ∑ (GHG contained per product × total number sold × % of GHG released during lifetime × GWP of GHG)

Note: If % released is unknown, assume 100%.

Activity Data Needed:

- Total quantities of products sold
- Quantities of GHGs contained per product
- % of GHGs released during product lifetime

Emission Factors Needed:

- GWP of the GHG contained, expressed as kg CO2e per kg of GHG

14.11.4 Indirect Use-Phase Emissions (Products that Indirectly Consume Energy)

Emissions = ∑ over use scenarios [(total lifetime expected uses × % of uses in scenario × number sold × fuel consumed per use × fuel emission factor)]

- ∑ over use scenarios [(total lifetime expected uses × % of uses in scenario × number sold × electricity consumed per use × electricity emission factor)]
- ∑ over use scenarios [(total lifetime expected uses × % of uses in scenario × number sold × refrigerant leakage per use × GWP of refrigerant)]
- ∑ over use scenarios [(total lifetime expected uses × % of uses in scenario × number sold × GHG emitted indirectly × GWP of GHG)]

Activity Data Needed:

- Average number of uses over lifetime of product

- Average use scenarios and their weighting (e.g., roasted, boiled, microwaved)
- Fuel consumed in each use scenario
- Electricity consumed in each use scenario
- Refrigerant leakage in each use scenario
- GHGs emitted indirectly in each use scenario

Emission Factors Needed:

- Combustion emission factors of fuels and electricity
- GWP of GHGs

14.11.5 Intermediate Products that Directly Consume Energy During Use

Emissions = ∑ (total intermediate products sold × total lifetime uses of final sold product × emissions per use of sold intermediate product)

Activity Data Needed:

- Type(s) of final product(s) produced from the reporting company's intermediate product(s)
- Percentage of intermediate product sales going to each type of final product
- Activity data to calculate use-phase emissions of the final product (as described previously)

Emission Factors Needed:

- Depending on the type of final product, the same emission factors as described for direct or indirect use-phase emissions (fuel, electricity, refrigerant, GHGs)

14.12 Summary of Calculation Methods for Category 12 (End-of-Life Treatment of Sold Products)

14.12.1 Waste-Type-Specific Method

Emissions = ∑ across waste treatment methods [(total mass of sold products and packaging × % of waste treated by method × emission factor of method)]

Activity Data Needed:

- Total mass of sold products and packaging from point of sale to end-of-life after consumer use (including transport and retail packaging)
- Proportion of waste treated by each method (e.g., % landfilled, incinerated, recycled)

Emission Factors Needed:

- Average waste treatment-specific emission factors for each disposal method (kg CO2e/kg)

14.13 Summary of Calculation Methods for Category 13 (Downstream Leased Assets)

14.13.1 Asset-Specific Method

Emissions =

- Scope 1 emissions of leased asset:
  ∑ [(quantity of fuel consumed × emission factor for fuel) + (quantity of refrigerant leakage × emission factor for refrigerant) + process emissions]
- Scope 2 emissions of leased asset:
  ∑ [(quantity of electricity, steam, heating, cooling consumed × emission factor)]
- Sum across all leased assets:
  ∑ Scope 1 and Scope 2 emissions of each leased asset

For leased building spaces not sub-metered by the tenant:
Allocated energy use = (reporting company's area ÷ building's total area) × building's occupancy rate × building's total energy use
Activity Data Needed:
- Asset-specific fuel use; electricity, steam, heating and cooling use; process and fugitive emissions (e.g., refrigerant leakage), or
- Asset-specific Scope 1 and Scope 2 emissions data

Emission Factors Needed:
- Site or regionally specific emission factors for energy sources (kg CO2e/unit)
- Emission factors for fugitive and process emissions

14.13.2 Lessee-Specific Method
Emissions =
- Scope 1 and Scope 2 emissions of lessee calculated similarly to asset-specific method
- Allocate emissions from each lessee:
  ∑ Scope 1 and Scope 2 emissions of lessee × (area, volume, quantity, etc., of leased asset ÷ total area, volume, quantity, etc., of lessee assets)

Activity Data Needed:
- Lessee's fuel use, electricity use, process and fugitive emissions, or Scope 1 and Scope 2 emissions data
- Physical or financial data for allocation (e.g., total area/volume/quantity of lessee's assets and leased assets)

Emission Factors Needed:
- Site or regionally specific emission factors for energy sources (kg CO2e/unit)
- Emission factors of fugitive and process emissions

14.13.3 Average-Data Method
Emissions =
- For leased buildings: ∑ (total floor space of building type × average emission factor per building type)
- For leased assets other than buildings or buildings with unavailable floor space: ∑ (number of assets × average emissions per asset type)

Activity Data Needed:
- Floor space of each leased asset
- Number of leased assets by building type
- Number of leased assets generating Scope 2 emissions (e.g., vehicles)

Emission Factors Needed:
- Average emission factors by floor space (kg CO2e/m²/year)
- Average emission factors by building type (kg CO2e/building/year)
- Emission factors by asset type (kg CO2e/asset/year)

14.14 Summary of Calculation Methods for Category 14 (Franchises)

14.14.1 Franchise-Specific Method
Emissions = ∑ (Scope 1 emissions + Scope 2 emissions of each franchise)
If franchise buildings are not sub-metered: Energy use from franchise (kWh) = (franchise's area ÷ building's total area × building's occupancy rate) × building's total energy use
Activity Data Needed:
- Scope 1 and Scope 2 emissions data from franchisees, or

- Site-specific fuel use, electricity use, and other process and fugitive emissions activity data

Emission Factors Needed:

- Site- or regionally-specific emission factors for energy sources (kg CO2e/unit)
- Emission factors of process emissions (e.g., refrigeration, air conditioning)

14.14.2 Average-Data Method

Emissions =

- For leased buildings (with floor space data):∑ (total floor space of building type × average emission factor per building type)
- For other asset types or buildings without floor space data: ∑ (number of buildings or assets × average emissions per building or asset type per year)

Activity Data Needed:

- Floor space of each franchise
- Number of franchises, by building type
- Number of franchise assets giving rise to Scope 2 emissions (e.g., vehicles)

Emission Factors Needed:

- Average emission factors by floor space (kg CO2e/m²)
- Average emission factors by building type (kg CO2e/building)
- Emission factors by asset type (kg CO2e/asset)

15.ACCOUNTING FOR EMISSIONS FROM WASTE-TO-ENERGY AND RECYCLING

15.1 Accounting for Emissions from Incineration with Energy Recovery (Waste-to-Energy)

Attributing emissions from waste-to-energy is similar to the approach taken for recycling. Companies may both generate waste that is incinerated with energy recovery and consume energy generated by waste-to-energy processes.

15.1.1 Key Guidance

- If a company purchases energy from the same facility to which it sends its waste, emissions from the waste-to-energy combustion process should not be double-counted. Upstream emissions from purchased energy generated from waste should be accounted for in Scope 2. Combustion emissions themselves are generally included in the grid-average emission factor.
- Companies should account for emissions from preparing and transporting waste for waste-to-energy in Category 5, but not the combustion emissions, which are captured in Scope 2 by the energy consumer.
- If waste is incinerated on-site under operational or financial control, the associated emissions are included in Scope 1, and Scope 2 decreases due to reduced purchased energy.
- Negative or avoided emissions from waste-to-energy should not be reported.
- This guidance does not apply to waste incinerated without energy recovery; all such emissions are reported under Scope 3, Category 5.

15.2 Accounting for Emissions from Recycling

Emission reductions from recycling occur due to:

- The difference in emissions between extracting and processing virgin materials versus preparing recycled materials for reuse.
- Reduced emissions that would otherwise have occurred if the waste were sent to landfills or other waste treatment methods.

Companies may encounter recycling in three different circumstances, each relevant to a different Scope 3 category.

15.3.1 Purchased Material with Recycled Content

If a company purchases a product or material that contains recycled content, the upstream emissions of the recycling processes are included in the cradle-to-gate emission factor for that product. These emissions are reflected in Category 1 (Purchased goods and services) or Category 2 (Capital goods). When the recycled material has lower upstream emissions than the equivalent virgin material, this results in lower emissions reported in the relevant category.

15.3.2 Operational Waste Sent for Recycling

If a company generates waste from its operations that is sent for recycling, the emissions associated with preparing and transporting this waste are reported under Category 5 (Waste generated in operations).

15.3.3 Products with Recyclable Content

Products sold with recyclable content eventually become waste, which may be recycled. The emissions generated in this process are reported under Category 12 (End-of-life treatment of sold products).

15.3.4 Avoiding Double Counting of Recycling Emissions

Because a company may both purchase recycled materials and sell recyclable products, methodologies are established to prevent double counting. The recommended approach is the recycled content method, which allocates emissions to the company that uses the recycled material (reported in Category 1).

To ensure accurate allocation:

- Examine which processes are included in the cradle-to-gate emission factor for the recycled material.
- Any processes not included in the factor but relevant to the company's supply chain should be allocated to Category 5 or Category 12.

The recycled content method is widely recommended for Scope 3 inventories due to its ease of use and compatibility with secondary emission factors. Companies may adopt other methods if more suitable, such as the closed loop approximation method, which accounts for the impact of end-of-life recycling on net virgin material acquisition. If uncertainty exists about which method is appropriate or the supply chain is complex, the recycled content method should be used to avoid double counting or miscounting emissions.

15.4 Reporting Negative or Avoided Emissions from Recycling

Claims of negative or avoided emissions associated with recycling go beyond reductions in processing emissions and reductions in waste treatment emissions in categories 5 (Waste Generated in Operations) or 12 (End-of-life treatment of sold products). These claims are based on comparing the emissions from processing recycled material to the emissions from producing the equivalent virgin material.

Any claims of avoided emissions should **not** be included in, or deducted from, the scope 3 inventory. Instead, they may be reported separately from scope 1, scope 2, and scope 3 emissions. Companies reporting avoided emissions should provide

supporting data, such as evidence that recycled materials are collected, recycled, and used, and detail the methodology, data sources, system boundary, time period, and other assumptions applied in the calculation. For more guidance, refer to the Scope 3 Standard under “Reporting additional metrics for recycling and waste-to-energy.”

15.5 Accounting for Emissions from Incineration with Energy Recovery (Waste-to-Energy)

Attributing emissions from waste-to-energy is similar to the approach taken for recycling. Companies may both generate waste that is incinerated with energy recovery and consume energy produced by waste-to-energy processes. If a company purchases energy from the same facility where it sends its waste, accounting for emissions from the combustion process both upstream and downstream would result in double counting. To avoid this, companies should account for upstream emissions from purchased energy generated from waste in scope 2. In most cases, emissions from waste combustion for energy will be included in the grid average emission factor.

Companies should account for emissions from preparing and transporting waste to a waste-to-energy facility under category 5, but should not include emissions from the combustion process itself. These emissions are instead included in scope 2 by the consumers of energy generated from waste. If waste is incinerated and used for on-site energy under operational or financial control, emissions from incineration are included as scope 1, while scope 2 decreases due to reduced purchased energy. Negative or avoided emissions from waste-to-energy should **not** be reported in the inventory.

This guidance does **not** apply to waste incinerated without energy recovery; all emissions from such combustion are reported under scope 3, category 5.

15.5.1 Reporting Additional Information for Recycling and Waste-to-Energy

Emissions from recycling and waste-to-energy may appear similar in their effect on scope 3 category 5 emissions, often approaching zero within the scope 3 boundary. Companies are encouraged to separately report additional metrics to capture the full GHG impact and make informed waste treatment decisions.

For waste-to-energy, companies may report emissions per unit of net electrical generation from combustion relative to the local grid average (tonnes CO2e per kWh). For example, incinerating plastic waste often results in more carbon-intensive electricity per kWh than the local grid average.

For recycling, companies may report emissions relative to producing equivalent virgin materials. This value is typically negative, reflecting lower upstream emissions of recycled materials. Any reported figures must be presented separately from the scope 3 inventory.

15.6 Accounting for Emissions from Wastewater

Emissions from wastewater can vary significantly depending on the level of treatment required, which is often determined by biological oxygen demand (BOD) and/or chemical oxygen demand (COD). Industries such as starch refining, alcohol refining, pulp and paper, vegetables, fruits and juices, and food processing typically have higher wastewater emissions, especially when wastewater is not treated onsite.

Companies in these industries should calculate wastewater emissions following the methods outlined in the 2006 IPCC Guidelines for National Greenhouse Gas Inventories. These methods account for the variability in wastewater composition and treatment processes to provide accurate estimates of GHG emissions.

15.7 Methods for Allocation Due to Recycling

15.7.1 Closed Loop Approximation Method

The closed loop approximation method accounts for the impact that end-of-life recycling has on the net virgin material acquisition. It assumes that recycled material displaces virgin material with the same inherent properties, allowing it to be used interchangeably in the product system. This method is also known as the 0/100 method, the end-of-life approach (common in the metal industry) or the closed loop method (ISO 14044:2006 and ISO 14049:2000 examples).

For this method to be applied correctly, the properties of the recycled material —chemical, physical, or otherwise—must closely match those of the virgin material input. This ensures that no additional modifications are required in the product's life cycle.

Material recovery facilities and recycled material preprocessing refer to the processes needed to convert collected waste into usable recycled material. Typical processes include sorting, shredding, cleaning, melting, and deinking. Under the closed loop approximation method, emissions or removals from recycling are not allocated to another product system. Instead, the creation of recyclable material offsets the need for virgin material, along with the emissions and removals associated with producing that virgin material.

Key considerations:

- Virgin material acquisition and preprocessing stage: All emissions from acquiring and preparing virgin materials are included, assuming all inputs are virgin.
- End-of-life stage: Includes all processes related to end-of-life treatment, including recycling.
- Virgin material displacement factor: Calculated as the recycling rate (recycled output ÷ virgin material input) multiplied by the attributable processes for virgin material acquisition and preprocessing. This factor applies only to virgin material with properties matching the recycled material.

For products with multiple material inputs, only the processes associated with the displaced material are considered. If recycled material is also used as an input, impacts from material acquisition and preprocessing are still calculated assuming all inputs are virgin to correctly apply the method. Alternatively, a hybrid approach using recycled content plus a closed loop for the remaining net material can be applied, but this is complex and generally not recommended.

The closed loop approximation method can also be applied within a single life cycle stage, such as reusing scrap generated during production.

15.7.2 Recycled Content Method

The recycled content method allocates the emissions and removals from the recycling process to the life cycle that uses the recycled material. It is suitable for open-loop situations where recycled material inputs and outputs occur. This method is also known as the cut-off method or the 100-0 method.

Key points:

- End-of-life stage: Includes all processes related to the end-of-life treatment of waste material output. It does not allocate emissions from recovered material outputs to other product systems.
- Emission reduction: Using recycled material reduces waste sent to treatment facilities, thereby lowering GHG emissions from end-of-life waste treatment.

- Upstream benefits: Reducing the need for virgin material acquisition lowers GHG emissions and removals from virgin material production, provided that recycling processes are less GHG-intensive than virgin extraction.
- Caution: If recycling processes are more GHG-intensive than virgin production, using recycled inputs could increase total product GHG inventory. Companies should be aware that optimizing for one impact category, such as GHG emissions, may lead to trade-offs with other environmental impacts, like material depletion.

15.8 Collecting Recycling Data

To comply with the attributional approach of the standard, companies should base recycled material output on either specific recycling data for the product or on average recycling data for the product in the geographic region where it is consumed, as defined by the product's use profile. Recycling data must follow the same collection and quality requirements outlined in Chapter 8.

Key points:

- Closed loop approximation method: Ensure that recycled material output data excludes material whose inherent properties have changed.
- Property change adjustments: If available data aggregates recycled materials and some property changes are known, assume a percentage of property loss based on other information, such as reduction in economic value or material properties like elasticity.
- Data limitations: If it is not possible to disaggregate data and property changes are only partially known, clearly note this as a data quality limitation in the inventory report.

16 Use-Phase Emissions

Direct Use-Phase Emissions: Direct use-phase emissions refer to the greenhouse gases emitted during the lifetime consumption of a final product. These emissions should be calculated based on the expected lifetime use of the product(s). The allocation methodology used to determine direct use-phase emissions must be disclosed during the target validation process. An exception applies for engines, where 100% of the direct use-phase emissions of the vehicle are reported.

Indirect Use-Phase Emissions: Indirect use-phase emissions are associated with products that consume energy only indirectly over their expected lifetime. These emissions are considered optional and are not included within the "minimum boundary" for Scope 3, Category 11 ("Use of Sold Products"). Examples include:

- Washing and drying of apparel for clothing manufacturers.
- Cooking and refrigeration of food products for food retailers.

Although optional, the methodology for calculating indirect use-phase emissions must be disclosed during the validation process.

More Examples of Use Phase

For **electronics**, relevant considerations include rechargeable batteries (energy stored and transmitted), with the first charge of the rechargeable battery before sale allocated to scope 2 of the producers. Other aspects involve sold piping systems (lost heat and cooling), power step-up and step-down transformers, and other power system equipment where electricity, heat, and cooling are lost. Components such as displays, microchips, memory drives, cameras, computer housing, and camera lenses are also included.

For **food and beverages**, emissions can arise from CO_2 release from beverages, cooling of ice for beverages, frying, microwaving, or cooking of frozen meals or other food items, and the use of household food waste disposers (for food producers). There is also direct cooling or heating of products in consumer homes. Additionally, the cooling or heating of products in retail stores, hotels, restaurants, pharmacies, or hospitals must be allocated to scope 3, category 9 ("downstream transportation and distribution").

For **household appliances**, relevant sources include large and small household appliances, ranging from washing machines to electric toothbrushes, along with lightbulbs, smart-home products, and charcoal or lighter fluid for barbecues. In addition, smart-home software use (computers, smartphones, and/or router energy consumption due to software use) is an important factor.

For **software and telecommunication services**, energy use relates to software itself, i.e., the energy consumption of computers or other electronic devices driven by software, and telecommunication contracts, i.e., the energy consumption of cell phones due to network use. Furthermore, the energy consumption of servers that run cloud-based software must be allocated to scope 3, category 1 ("purchased goods and services").

16.1 Calculating Emissions from Processing of Sold Products

Companies may use one of two methods to calculate emissions from the processing of sold intermediate products by third parties:

- Site-specific method: Determines the amount of fuel, electricity, and waste generated from processing sold intermediate products and applies the appropriate emission factors.
- Average-data method: Estimates emissions based on average secondary data, such as average emissions per process or per product.

The choice of method depends on the company's business goals and ability to collect data from downstream value chain partners. Collecting primary data from third parties may be difficult; in such cases, the average-data method is recommended.

16.1.1 Site-Specific Method

To calculate emissions using the site-specific method, companies should collect one of the following from downstream value chain partners:

- Relevant activity data (e.g., fuel use, electricity use, refrigerant use, and waste) and corresponding emission factors for each downstream process.
- GHG emissions data for each downstream process provided by downstream partners.

If intermediate goods or other material inputs are involved in downstream processes, emissions should be allocated proportionally between the company's products and other inputs. All processing steps through to the final product must be accounted for.

16.1.1.1 Activity Data Needed

Companies should collect data on:

- Types and quantities of intermediate goods sold.
- Either site-specific GHG emissions or activity data from downstream processes, including:
  - Quantities of energy consumed (electricity and fuels).
  - Mass of waste generated, where possible.
  - Activity data for non-combustion emissions, if applicable (industrial process or fugitive emissions).

16.1.1.2 Emission Factors Needed

If site-specific activity data is collected, the following emission factors should also be obtained:

- Fuel-specific emission factors.
- Electricity emission factors.
- Emission factors for waste outputs, where possible.
- Emission factors for non-combustion emissions, if applicable.

16.1.1.3 Data Collection Guidance

Data should be collected from internal records on the types and mass of intermediate goods sold. Downstream partners can provide activity or GHG emissions data from sources such as:

- Internal IT systems.
- Utility bills.
- Purchase receipts.
- Meter readings.

Emission factor sources may include:

- Company- or manufacturer-developed emission factors.
- Industry association data.

16.1.2 Average-Data Method

The average-data method estimates emissions from the processing of sold intermediate products by applying industry-average emission factors to the downstream processes involved in transforming or processing the products into final products. This method is recommended when collecting primary data from downstream value chain partners is not feasible.

If multiple input types are used in the downstream processes, emissions should be allocated to the intermediate product sold by the reporting company, following the allocation guidance in chapter 8 of the Scope 3 Standard.

16.1.2.1 Activity Data Needed

For each type of sold intermediate product, companies should collect data on:

- The process(es) involved in transforming or processing sold intermediate products into a usable final product.
- Information needed for allocation, such as mass or economic value.

16.1.2.2 Emission Factors Needed

Companies should collect:

- Average emission factors for processing stages required to transform the sold intermediate product into a final product, expressed in units of emissions (e.g., CO2, CH4, N2O) per unit of product (e.g., kg CO2/kg of final product).

Care must be taken when selecting secondary data sources to understand the boundaries of the data and determine whether additional calculations are required to avoid double counting.

16.1.2.3 Data Collection Guidance

Activity data can be sourced from:

- Purchasing records.
- Internal data systems.
- Industry-average data from associations or databases.

Emission factor sources may include:

- Life cycle databases.

- The GHG Protocol website.
- Companies or manufacturers.
- Industry associations.

16.3 Emissions from Use of Sold Products

Direct Use-Phase Emissions (Required)

These are emissions from products that directly consume energy, such as fuels or electricity, during their use. Examples include:

- Automobiles, aircraft, engines, motors
- Power plants and buildings
- Appliances, electronics, and lighting
- Data centers and web-based software

Other direct emissions arise from fuels and feedstocks, such as petroleum products, natural gas, coal, biofuels, and crude oil.

Products that contain or form greenhouse gases (GHGs) emitted during use also contribute to direct use-phase emissions. Examples include:

- CO2, CH4, N2O, HFCs, PFCs, SF6
- Refrigeration and air-conditioning equipment
- Industrial gases, fire extinguishers, fertilizers

Indirect Use-Phase Emissions (Optional)

These emissions occur when products indirectly consume energy during use, such as for heating, washing, or cooking. Examples include:

- Apparel (requires washing and drying)
- Food products (requires cooking and refrigeration)
- Pots and pans (require heating)
- Soaps and detergents (require heated water)

Indirect use-phase emissions are optional and are not part of the minimum reporting boundary for scope 3 category 11, but their calculation methodology should be disclosed if included.

16.4 Calculating Emissions from Use of Sold Products

This section provides guidance on calculating a company's direct and indirect use-phase emissions.

16.4.1 Calculation Methods for Direct Use-Phase Emissions

Companies should first identify the product categories that generate direct-use emissions. Products with direct-use phase emissions include:

Products that directly consume energy (fuels or electricity) during use

- Break down the use phase, measure emissions per product, and aggregate across all products.

Fuels and feedstocks

- Collect fuel use data and multiply by representative fuel emission factors.

Products containing or forming greenhouse gases during use

- Collect data on the GHG content of the product, the percent released, and multiply by the GHG emission factors.

For companies with many products or products with similar use phases, it is acceptable to group similar products and use average statistics for a typical product within each group. For example, a beverage company could group products by packaging type and apply the same use profile to all products in the group.

16.4.2 Direct Use-Phase Emissions from Products that Consume Energy

To calculate emissions for products that directly consume fuels or electricity:

Formula: Lifetime number of uses × quantity sold × emission factor per use
Activity Data Needed:

- Total lifetime expected uses of product(s)
- Quantities of products sold
- Fuel used per use of the product
- Electricity consumption per use of the product
- Refrigerant leakage per use of the product

Emission Factors Needed:

- Life cycle emission factors for fuels
- Life cycle emission factors for electricity
- Global warming potential (GWP) of refrigerants

Data Collection Guidance:

- Activity data sources: Internal systems, sales records, surveys, industry associations
- Emission factor sources: Life cycle databases, company- or supplier-developed emission factors, industry associations

It is important to account for regional variations in electricity emissions, as grid factors can differ significantly. For globally used products, a global average can be used, but applying regional or national grid emission factors for each use scenario will improve accuracy. Considering scenario uncertainty can also help refine estimates.

16.4.3 Direct Use-Phase Emissions from Fuels and Feedstocks

Definition:
Feedstocks are raw materials used to produce fuels, power, or other products, such as biomass for energy, crops for biofuels, or crude oil for plastics.
Calculation Method:

- For companies producing fuels and/or feedstocks, calculate use-phase emissions by multiplying the quantity of fuels/feedstocks sold by their combustion emission factors.
- If the feedstock is not combusted during the use phase, no emissions are calculated.
- Only combustion emissions are reported in this category; upstream emissions from feedstock production are already included in the company's Scope 1, Scope 2, or other Scope 3 categories, avoiding double counting.

Activity Data Needed:

- Total quantities of fuels/feedstocks sold

Emission Factors Needed:

- Combustion emission factors for each fuel/feedstock

Data Collection Guidance:

- Use internationally recognized sources such as the IPCC Fourth Assessment Report or emission factors included in GHG Protocol calculation tools.
- Emissions may vary depending on:
  - Technology: Completeness of combustion can differ across applications
  - Fuel mix: Variations in fuel composition across regions or companies (e.g., aromatic hydrocarbons in gasoline)

Companies should select the most representative emission factors for their specific fuels or feedstocks to ensure accurate calculations.

16.4.4 Direct Use-Phase Emissions from Products Containing or Forming Greenhouse Gases

Definition:

Some products contain GHGs that are released during use or at the end of their useful life, such as refrigerants in cooling equipment.

Calculation Method:

- For companies producing such products, calculate emissions by multiplying:
  i. Quantities of products sold
  ii. Percentage of GHGs released per unit contained in the product
  iii. Global Warming Potential (GWP) of the GHGs released
- If a product releases multiple types of GHGs, calculate CO_2-equivalent emissions for each gas and aggregate for total emissions.

Activity Data Needed:

- Total quantities of products sold
- Quantities of GHGs contained in each product
- Percentage of GHGs released over the product's lifetime

Emission Factors Needed:

- GWP of each GHG, expressed in kg CO_2e per kg of GHG (e.g., 25 kg CO_2e/kg CH_4)

Additional Guidance:

- Companies may group similar products with comparable use-phase profiles to simplify calculations.
- A breakdown by GHG type (CO_2, CH_4, N_2O, etc.) can be reported separately, though total CO_2-equivalent emissions must be provided.

16.5 Indirect Use-Phase Emissions from Products That Indirectly Consume Energy

Definition:

Indirect use-phase emissions arise from products that do not consume energy directly but require energy or result in GHG emissions during their use. Examples include apparel requiring washing and drying, or food requiring cooking and refrigeration.

Calculation Method:

- Create or obtain a typical use-phase profile for the product over its lifetime.
- Multiply the activity data by the relevant emission factors to estimate emissions.

Activity Data Needed:

- Average number of uses over the product's lifetime
- Average use scenarios (weighted if multiple scenarios exist)
- Fuel consumed in use scenarios
- Electricity consumed in use scenarios
- Refrigerant leakage in use scenarios
- Indirect GHGs emitted in use scenarios

Emission Factors Needed:

- Combustion emission factors for fuels
- Emission factors for electricity

Additional Guidance:

- Sector-level agreements on standard assumptions for use-phase profiles are recommended to improve consistency and comparability.

- Emission factors should reflect the geography where the product is sold and the reporting year.

16.6 Data Collection Guidance for Indirect Use-Phase Emissions

Overview:

Generating a representative use-phase profile can be challenging because the same product may consume varying amounts of energy depending on how it is used. For example, cooking a potato by roasting, boiling, or microwaving will each require different energy levels, resulting in different emissions.

Guidance for Data Collection:

- Develop a use profile that reflects the typical use scenarios over the product's lifetime by the intended consumer population.
- Sources for representative data may include:
  - Industry-recognized benchmark testing specifications
  - Product category rules
  - Previous emissions studies
  - Consumer behavior studies

Additional Recommendation:

- If multiple use scenarios exist for a product, companies may create a weighted average based on the actual distribution of usage patterns.

16.7 Calculation Method for Sold Intermediate Products

Overview:

When a company sells intermediate products that directly emit GHGs during their use phase, it must account for the direct use-phase emissions associated with these products. This includes emissions from:

- Use of the sold intermediate product that directly consumes fuel or electricity
- Fuels and feedstocks
- GHGs released during product use

Companies may optionally include indirect use-phase emissions of sold intermediate products.

Handling Unknown End Uses:

If the end use of sold intermediate products is unknown or highly variable, and it is not feasible to reasonably estimate the downstream emissions, companies may disclose and justify the exclusion of all downstream emissions related to these products.

Activity Data Needed:

- Types of final products produced from the company's intermediate products
- Percentage of intermediate product sales going to each type of final product
- Activity data required to calculate the use-phase emissions of the final product (as described in prior sections)

Emission Factors Needed:

- Depending on the type of final product, emission factors will be the same as those described earlier for direct or indirect use-phase emissions.

16.8 Calculating Emissions from End-of-Life Treatment of Sold Products

Overview:

Emissions from downstream end-of-life treatment of sold products should follow the same calculation methods as category 5 (Waste generated in operations). The key difference is that data should be collected on the total mass of sold products and packaging from the point of sale through the end of life after consumer use.

The availability and quality of data for sold products are often lower than for operational waste, as companies may not know consumer disposal behaviors across regions.

16.8.1 Activity Data Needed

Companies should collect:

- Total mass of sold products and packaging from the point of sale through to end-of-life after consumer use (including packaging used for transport and packaging disposed of before the final product's end-of-life)
- Proportion of this waste treated by different methods (e.g., percent landfilled, incinerated, recycled)

16.8.2 Emission Factors Needed

- Average waste-treatment-specific emission factors based on all waste treatment types

16.8.3 Data Collection Guidance

- Collect data on waste type(s) and amounts after sale through end-of-life disposal, including packaging and product waste. For consumables (e.g., food and drink), use average proportion wasted.
- Total waste may equal total products sold, but for consumed products, waste is likely lower; for products combusted for energy, it could be zero.
- To determine the proportion of waste treated by different methods, refer to:
  - Company research and internal data on post-consumer treatment
  - Government directives for specific products
  - Industry associations or consumer disposal research
  - Average waste treatment data from sale to end-of-life

16.8.4 Calculation Methods

16.8.4.1 Waste Treatment Company Method

- Collect emissions directly from waste treatment companies; no emission factors required as the company calculates them.

16.8.4.2 Waste-Type-Specific Method

Emissions (tCO_2e) = Waste produced (tonnes or m^3) × Waste type and treatment-specific emission factor (kg CO_2e per tonne or m^3)

Activity Data Needed:

- Waste produced (tonnes or m^3) and type of different waste generated
- Specific waste treatment method applied for each waste type (e.g., landfill, incineration, recycling)

Emission Factors Needed:

- Waste-type-specific and treatment-specific emission factors, including emissions from end-of-life processes and transportation

16.8.4.3 Average-Data Method

Emissions (tCO_2e) = Total mass of waste × Proportion treated by method × Emission factor of method

Activity Data Needed:

- Total mass of waste generated
- Proportion of waste treated by different methods (e.g., % landfilled, incinerated, recycled)

Emission Factors Needed:

- Average waste treatment-specific emission factors across all disposal types

16.8.5 Calculation Resources

- European Union data on average end-of-life treatment scenarios
- U.S. Environmental Protection Agency waste generation, recycling, and disposal statistics
- Waste Resources and Action Programme (WRAP) for average food and drinks waste in the UK

16.9 Biogenic CO_2 Removal and Total Inventory Calculations

16.9.1 Biogenic CO_2 Removal Calculation

When CO_2 is removed from the atmosphere by a product during its use phase (e.g., CO_2 uptake by cement), removal data may come as a removal rate per mass or volume of product.

- The most typical atmospheric CO_2 removal occurs through biogenic uptake during photosynthesis.
- Companies often know only the amount of biogenic carbon in the material or product. To convert this to CO_2: kg CO_2e = kg Biogenic Carbon × (44 ÷ 12) × GWP (1 for CO_2)
- Note: CO_2 removal data does not require an additional emission factor; it is multiplied directly by GWP = 1.

16.9.2 Total Inventory Results (CO_2e/unit of analysis)

Once inventory results in CO_2e are calculated, all results should be expressed on the same reference flow basis. For example, if the reference flow is 10 kg but inventory results are per kg, multiply results by 10 to align with the unit of analysis.

The total CO_2e/unit of analysis represents the greenhouse gases entering the atmosphere for fulfilling the product function:

- Emissions: treated as positive values
- Removals: treated as negative values

Components of Total Inventory Results: Total CO_2e per unit of analysis = CO_2e Emissions (Biogenic) – CO_2e Removals (Biogenic) + CO_2e Emissions (Non-Biogenic) – CO_2e Removals (Non-Biogenic) + CO_2e Land-Use Change Impacts

- Land-use change impacts are included if attributable to the product (Appendix B provides guidance).
- If no land-use change or removals occur, total inventory results are simply the sum of CO_2e emissions per reference flow.

16.9.3 Percentage of Total Inventory Results by Life Cycle Stage

Inventory results per life cycle stage are calculated as:

Percentage per stage = (CO_2e per life cycle stage ÷ Total CO_2e inventory results) × 100

- Land-use change impacts and removals are typically included in material acquisition/preprocessing or production stage.
- Removals during the use stage (e.g., CO_2 absorption by cement) may result in a negative percent impact, which should be clearly noted.
- The virgin material displacement factor is reported separately to avoid negative impacts in the end-of-life stage but is included in total inventory results.

16.9.4 Cradle-to-Gate and Gate-to-Gate Inventory Results

- Reporting inventory results by cradle-to-gate and gate-to-gate provides insight into emissions and removals under the company's control.
- Companies may choose not to report gate-to-gate results if it risks confidentiality; this should be noted as a limitation.
- For cradle-to-gate inventories, total inventory results represent the cradle-to-gate outcome, so repetition is unnecessary.

16.10 LCA Changes in Production/Process Accounting

In Life Cycle Assessment (LCA), the term "avoided emissions" is sometimes used to describe allocation due to system expansion or emission reductions from a reduction project within the product's boundary. These cases are not considered avoided emissions as defined by this standard and therefore are not required to be reported separately from the inventory results.

However, the requirements for allocation and performance tracking still apply in these cases.

17. CALCULATING EMISSIONS FROM EQUITY INVESTMENTS

17.1 Investment-specific method

Total CO_2e per equity investment = Scope 1 and Scope 2 emissions of equity investment × Share of equity (%)

- Scope 1 and 2 emissions of investee company
- The investor's proportional share of equity in the investee
- If significant, companies should also collect scope 3 emissions of investee company (if investee companies are unable to provide scope 3 emissions data, scope 3 emissions may need to be estimated using the Average-data method)
- If using the investment-specific method, the reporting company collects emissions data from investees, so no emission factors are required

17.2 Average-data method

Total CO_2e per equity investment = ((Investee company total revenue ($) × Emission factor for investee's sector (kg CO_2e/$ revenue)) × Share of equity (%))

- Sector(s) the investee company operates in
- Revenue of investee company (if the investee company operates in more than one sector, the reporting company should collect data on the revenue for each sector in which the investee company operates)
- The investor's proportional share of equity in the investee
- EEIO emission factors for the sectors of the economy that the investments are related to (kg CO_2e/$ revenue)

17.3 Calculating emissions from project finance and from debt investments with known use of proceeds – Project-specific method

Total CO_2e per project = Scope 1 and Scope 2 emissions of relevant project in the reporting year × Share of total project costs (%)

- Scope 1 and 2 emissions that occur in the reporting year for the relevant projects
- The investor's proportional share of total project costs (total equity plus debt)
- If using the project-specific method, the reporting company collects emissions data from investees, so no emission factors are required

17.4 Calculating emissions from project finance and from debt investments with known use of proceeds – Average-data method

Construction phase:

Total CO_2e per project = ((Project construction cost in the reporting year ($) ×

Emission factor of relevant construction sector (kg CO_2e/$ revenue)) × Share of total project costs (%))

Operational phase:

Total CO_2e per project = ((Project revenue in the reporting year ($) × Emission factor of relevant operating sector (kg CO_2e/$ revenue)) × Share of total project costs (%))

- Project costs in the reporting year (if the project is in the construction phase); or
- Revenue of the project (if the project is in the operational phase); and
- The investor's proportional share of total project costs (total equity plus debt)
- EEIO emission factors for the relevant construction sector that the investments are related to (kg CO_2e/$) (if the project is in the construction phase); or
- EEIO emission factors for the relevant operating sector that the investments are related to (kg CO_2e/$) (if the project is in the operational phase)

17.5 Calculating total projected lifetime emissions from project finance and debt investments with known use of proceeds – Project-specific method.

Total projected CO_2e per project = ((Projected annual emissions of project × Projected lifetime of project) × Share of total project costs (%))

- Calculating projected lifetime emissions typically requires making assumptions about the operation of the asset and its expected lifetime. The data needed to calculate expected emissions will depend on the type of project. Companies should collect:
  - Expected average annual emissions of project. For power plants, for example, emissions can be derived from the plant's capacity and heat rate, the carbon content of the fuel, and projected capacity utilization
  - Expected lifetime of project

18. KEY CONCEPTS IN LAND-USE IMPACTS

Carbon stock refers to the total amount of carbon stored on a plot of land at any given time in one or more of the following carbon pools: biomass (above and below ground), dead organic matter (dead wood and litter), and soil organic matter. A change in carbon stock can refer to additional carbon storage within a pool, the removal of CO2 from the atmosphere to the carbon stock, or the emission of CO2 to the atmosphere from the carbon stock.

Land-use change occurs when the demand for a specific land use results in a change in carbon stocks on that land. A change in carbon stock can occur from one land-use category to another (e.g., converting forest to cropland) or within a land-use category (e.g., converting a natural forest to a managed forest or converting agricultural land from till to no-till). Land-use change does not include changes in crop cover or crop rotations that occur within the cropland category or forest harvesting and regeneration into the same general forest type, for which the regenerated forest is expected to have comparable carbon stocks to the harvested forest. Land-use categories include forest land, cropland, grassland, wetlands, settlements, and other lands such as bare soil, rock, ice, etc.

Land-use change impacts are the emissions and removals due to land-use change.

18.1 Determining attributable land-use impacts

Land-use impacts are attributable to a product if the following are true:

- The carbon stock change is the direct result of extraction or production of biogenic material to create a product
- The carbon stock change was caused by human intervention with the intent of creating a product

- The carbon stock change occurred within the assessment period – 20 years or a single harvest period from the extraction (e.g., harvesting) of a biogenic product or product component, whichever timeframe is longer

18.2 Examples

18.2.1 A product is made from an annual crop that was harvested in 2010. The crop is from a plot of land where the last known carbon stock change occurred 50 years ago. In this case no land-use change impacts are attributable to the product.

18.2.2 A product is made from wood that is extracted from a naturally grown forest (extraction and production occur in the same year). If the extraction of above-ground biomass causes a change in carbon stock of the land, the impacts of the land-use change are attributable to the product.

18.2.3 A product is made from wood that is grown on a plantation. The wood takes 28 years to grow, and is harvested in 2010 from a plot of land that was converted from a natural growth forest in 1982. Because the length of the harvest cycle is longer than 20 years, the company must consider any carbon stock changes that may have occurred up to 28 years ago (from 2010 to 1982). Therefore, the impacts of the land-use change (i.e., the original clearing of the natural growth forest) are attributable to the product.

18.2.4 A product is made from a bi-annual crop that was harvested in 2010. The plot of land used to grow the crop was converted from forest in 2000 due to a naturally occurring fire. Because the carbon stock change was not caused by human intervention with the intent of creating a product, the land-use change impacts are not attributable to the product.

18.3 Calculating land-use change impacts

For example, if the reporting company owns the land from which a product is harvested, primary data are required. Primary data from a supplier is preferred for land not owned by the reporting company. These types of data are collected directly from the production site, with actual areas and the mass or volume of inputs used.

Even with primary data from the production site, it is unlikely that primary data is available for the measurement of carbon stock changes and emissions from soils. In some cases secondary data is available in peer-reviewed journals; otherwise, common sources include:

18.3.1 Sector-specific activity data/emission factors

These data are usually provided by associations, cooperatives, and institutes representing a particular sector. It can include aggregate activity data/ emissions from site-specific sources.

18.3.2 Country-specific activity data/emission factors

Information that reflects country-specific biomes, agricultural practices, climate conditions, soil types, vegetation groups, etc. This can be further broken down into regional data. This type of information can be found in national greenhouse gas inventories and other official government publications, as well as from country experts.

18.3.3 Generic activity data/emission factors

These data refer to broad categories, such as high activity clay soils and tropical rainforest, and usually include carbon stock change impacts as well as land-use change practice emissions within the default emission factor.

18.3.4 Distribution of land-use change impacts

Once land-use change impacts are deemed attributable and impacts are identified, a company needs to distribute those impacts between the studied

product and other co-products that are outputs of the land. This is because, in most cases, land-use change occurs on land that produces products over many years, and therefore it is not appropriate to apply all the land-use change impacts to the first products generated within the area.

A company has calculated a carbon stock change associated with the product (in this example, a crop) of 150 tons. The next question is how to distribute those emissions to the products that are harvested from that land. Three ways land-use change impacts can be distributed over time:

A) single year, B) 20 year constant, or C) 20 year decline.

In this standard, land-use change impacts are distributed using option B: evenly over an amortization period of either 20 years or the length of one harvest (whichever is longer). This option was chosen as the most consistent way to distribute impacts for use in a GHG inventory, as both option A and option C create an incentive for companies to delay inventory reporting in an effort to reduce land-use change impacts. It is recognized that applying any time period to amortize emissions creates an arbitrary cut off after which companies are free to grow products on the land without a land-use change burden. However, identifying no time period would create additional uncertainties and inconsistent inventories.

18.3.5 Distribution methods depending on harvested product

There are several ways a company may distribute land-use change impacts using the amortization period depending on the harvested product:

18.3.5.1 For an annually harvested crop, a company applies 1/20th of the impacts to the products produced from each yearly harvest

18.3.5.2 For a semi-annual crop or herbaceous plant, a company may estimate the production of the land over 20 years and then apply the impacts to each ton of harvested biomass

18.3.5.3 For biomass with an extended harvest period (greater than 20 years) or where additional cultivation of the land is not planned, all of the land-use change impacts are applied to the harvested products from the first harvest period

Methods 1 and 2 can be used for both annual and semi-annual crops depending on the preference of the company.

18.4 Forestry and wood products

Some forest products are grown on managed forest plantations that are harvested over relatively short time frames, while others may be extracted from natural forests that take over 100 years to grow. Some forests are removed with the intent of producing annual crops, while others are removed for the stock of wood that can be extracted at the time of removal. Depending on the type of product or wood being studied and the location where that wood is cultivated, vastly different harvesting techniques occur which have a significant effect on the amount and distribution of land-use change impacts. Furthermore, co-product allocation may be needed during land-use change if the converted land also produces biogenic co-products.

If the studied product is a crop but the land-use change event created a co-product of wood, a company needs to accurately allocate these emissions. The following scenarios provide some insight into the correct distribution and allocation of land-use impacts due to forest and wood products.

18.4.1 Scenario A: A forest is harvested for wood but the land is not converted into another category or the future use of the land is unknown

In this scenario, any stock change that is calculated based on the density

change of the forest is attributable to the products created from the harvested wood. No distribution is needed because additional growth is not planned, or is unknown.

18.4.2 Scenario B: A forest is harvested for wood then converted into another managed land category

In this scenario, land-use change impacts should be distributed to all products produced by the land within the amortization period. Consider an example in which a stock change of 150 tons of carbon is calculated with an initial harvest of 100 tons of wood and an annual harvest of 1 ton of crop for the remaining 19 years of the amortization period. This means that 150 tons of carbon are distributed among 119 tons of products. The additional impacts of land-use change (e.g., liming applications) may also need to be distributed. This scenario is only applicable when the converted land is managed and the production of that land is known. In this context, managed refers to land that is continuously maintained for the purpose of cultivating and harvesting a product. Distribution is not applicable for forest land that has been harvested and replanted but is not maintained, or for a plot that is replanted and managed but with an extensive harvest period (greater than 50 years). In both cases, the uncertainty associated with the eventual production of the replanted product makes it most accurate to apply all land-use change impacts to the first harvest of wood.

18.4.3 Scenario C: A forest is converted to another land category and the wood is not harvested into a co-product

In this scenario, a company may not allocate any land-use change impacts to the wood as it was not used to create a co-product. All land-use change impacts (including the burning of the wood not recovered) must be distributed to the product produced on the converted land. If a company does not have data that justifies the use of scenario B (i.e., proof that the wood was harvested and used for a product) then scenario C is used.

18.4.4 When the specific land use is unknown

When a company has limited information on the specific land from which the product or product components are extracted or harvested, it can be difficult to determine how to attribute or distribute impacts. This situation occurs when a company buys crops or biomass from a supplier who receives indistinguishable shipments from a wide range of land-based sources. Under such circumstances, primary data are not available and secondary data are used to calculate stock changes and determine how much land-use change impacts should be distributed to a product.

The first step in estimating land-use change impacts is to determine in what location the crops or biomass were likely grown. If the crop or biomass is grown only in certain locations due to climates and soil types, those locations should be used. If the crop or biomass is grown in many locations, a company may choose the largest producing location or the most likely location (e.g., due to proximity to the production facility). Companies are encouraged to perform scenario uncertainty if more than one location is plausible. Companies may also take an average of locations if data are available to support that calculation (e.g., all locations have carbon stock change data available).

18.4.5 Data sources for estimating carbon stock and land-use change impacts

Once the location has been determined, companies may use the following data to estimate the carbon stock and land-use change impacts:

- Land-use imaging and/or agricultural demand-based models
- Average data, including:
- International statistics

• Country- or region-specific statistical databases
• Statistical yearbooks

Land-use imaging and/or agricultural demand-based models include using remote sensing or GIS data to estimate land-use change in a particular location or market-based models to estimate land-use change based on the market trends of a crop or wood product. For example, if the studied product is a crop assumed to be produced in New Zealand, and satellite imagery shows that land use for that crop has remained constant in New Zealand for the past 20 years, then the company can assume that no land-use change impacts are attributable to their product. While these methods may be the most accurate, they are often complex, time consuming, and not freely available. Additionally, they may not provide an accurate representation for some countries. If a company has access to these tools they are encouraged to use them to determine land-use change impacts as long as the modeled results are justified and transparent.

18.4.6 Use of average statistics

When a company does not have access to models or imaging data, it may use average statistics to estimate land-use change impacts. For example, companies may use the agricultural or forestry statistic for the assumed location to determine the change in land occupation for the studied product versus the total land change in that location. The same technique may be used for managed wood products using forestry data. If the crop or biomass that is being studied is shown to occupy less land over the 20-year assessment period, the company can assume that no land-use change has taken place. If the amount of land occupied by the crop or biomass being studied has increased, then land-use change impacts are attributable. In this case the company needs to assume what the original land category was. This should be based on the type of land present in the assumed location and when more than one land type is possible the conservative choice should be made.

It is important to note that any assumptions made about land-use change impacts are only estimations and subject to much uncertainty. Because these estimation techniques cannot identify when the land-use change occurs, companies should always assume 1/20th of the land-use change impact. Companies may also choose not to make any assumptions about land-use change and only use the worst case scenario (e.g., all land is converted from the most carbon rich land category). Information on the methods used to determine land-use change impacts should be included in the inventory report for transparency.

19. SCIENCE-BASED TARGETS (SBT)

Before setting any supply chain emission reduction targets, companies must complete a full scope 3 greenhouse gas (GHG) inventory, following the GHG Protocol Corporate Value Chain (Scope 3) Accounting and Reporting Standard.

19.1 Scope 3 emissions in SBTs

- Scope 3 emissions must be included in a company's near-term SBT if these emissions represent 40% or more of total scope 1, 2, and 3 emissions.
- Scope 3 targets must cover a minimum of 67% of total scope 3 emissions, in accordance with SBTi near-term Criteria.

19.2 Scope 3 screening

- Conduct a scope 3 screening to provide an initial emissions estimate across scope 3 categories.

- This screening helps to:
  - Evaluate which categories are most significant
  - Identify categories offering the greatest reduction opportunities
  - Determine which categories are most relevant to the company's business goals

19.3 GHG estimation methods

- Companies should identify the GHG estimation method and the relevant data owners for each source.
- Scope 3 screening exercises are normally based on procurement spend data (i.e., the total annual amount spent on goods and services), which are converted to GHG emissions using Environmentally Extended Input-Output (EEIO) conversions.
- Other estimation methods such as industry averages or other proxy data can also be used.

19.4 Overview of considerations for setting supply chain targets

- Target recommendations: Include key criteria such as coverage, ambition, and timeframe.
- Supplier inclusion: Recommended list of suppliers to include in the target and relevant analysis (by size, category, etc.).
- Supplier expectations: Define expectations regarding target setting and reporting progress.
- Implementation resources: Identify supporting tools, services, and costs to implement supplier engagement.
- Risks: Assess risks associated with new suppliers or consequences of not reaching the target.
- Team roles: Define the team's responsibilities and the steps required for implementation.

19.5 Target Setting

A comparison of boundary, ambition, timeframe, and methods between near-term and long-term targets:

19.5.1 Boundary – What percentage of emissions inventory coverage is required?

19.5.2 Ambition – What is the ambition level of limiting temperature rise?

19.5.3 Timeframe – What is the timeframe to meet targets?

19.5.4 Methods – What are the eligible methods to set targets?

19.6 Near-term SBTs

Scope 1 and 2:

- Boundary: 95%
- Ambition: 1.5°C
- Timeframe: 5–10 years
- Methods: Cross-sector absolute reduction, sector-specific absolute reduction, sector-specific intensity convergence (SDA), renewable electricity

Scope 3:

- Boundary: If >40% of total emissions, 67% coverage
- Ambition: Well-below 2°C
- Timeframe: 5–10 years

- Methods: Cross-sector absolute reduction, sector-specific absolute reduction, sector-specific intensity convergence (SDA), supplier/customer engagement, Scope 3 economic intensity reduction, Scope 3 physical intensity reduction

19.7 Long-term SBTs

Scope 1 and 2:

- Boundary: 95%
- Ambition: 1.5°C
- Timeframe: 2050 latest (2040 for the power and maritime transport sectors)
- Methods: Cross-sector absolute reduction, sector-specific absolute reduction, sector-specific intensity convergence (SDA), renewable electricity (maintenance target)

Scope 3:

- Boundary: 90%
- Ambition: 1.5°C
- Timeframe: 2050 latest (2040 for the power and maritime transport sectors)
- Methods: Cross-sector absolute reduction, sector-specific absolute reduction, sector-specific intensity convergence (SDA), Scope 3 economic intensity reduction, Scope 3 physical intensity reduction

19.8 Determining if a Supplier Engagement Target is Appropriate

For most companies, supply chain-related emissions represent a substantial portion of their Scope 3 emissions. The following categories often make up the greatest share of supply chain emissions:

19.8.1 Category 1 – Purchased Goods and Services:

All upstream (cradle-to-gate) emissions resulting from products and services purchased by the company, covering both direct and indirect procurement.

19.8.2 Category 2 – Capital Goods:

All upstream (cradle-to-gate) emissions from the production of capital goods purchased by the company, such as facilities, buildings, vehicles, and equipment.

19.8.3 Category 4 – Upstream Transportation and Distribution:

Emissions from all third-party transportation and distribution of products purchased by the company.

19.8.4 Typical Situations for Choosing Supplier Engagement Method:

- Limited access to primary supplier or product-specific emissions data, resulting in spend-based calculations and inhibiting the ability to track supplier- or product-level emission reductions.
- Extremely complex supply chain or product mix, making tracking supplier- or product-specific emission reductions cumbersome and costly.
- Companies that do not produce physical goods, resulting in a footprint primarily driven by indirect procurement with limited influence over suppliers.
- Emissions reduction levers for achieving minimum absolute or intensity-based Scope 3 targets are not yet identified or difficult to implement.

19.8.5 Boundary:

Engagement targets can be applied across Scope 3 categories where the company has a credible level of engagement with the relevant supplier activities.

19.8.6 Formulation:

The target should specify the percentage of emissions from relevant

categories covered by the engagement target, or, if emissions information is unavailable, the percentage of annual procurement spend covered.

19.8.7 Timeframe:

Engagement targets must be achieved within five years from the target submission date.

19.8.8 Level of Ambition:

Suppliers must set targets aligned with the current SBTi Criteria. As SBTi Criteria are occasionally updated, all new supplier targets reported should align with the latest criteria.

19.8.9 Supplier Expectations:

- Set science-based-aligned Scope 1 and 2 targets at minimum. Scope 3 targets are required if these emissions are greater than 40% of the supplier's total emissions.
- Review targets to confirm alignment with SBTi Criteria and Guidelines. Validation through SBTi is recommended but not required; if not validated, the company must develop a process to review them.
- Report progress against their target on an annual basis, either publicly or through the annual data collection process.

19.8.10 Supplier Incentives

Deploying incentives to drive supplier action to track emissions and set SBTs can be a powerful mechanism to accelerate progress. Approaches can vary, from "carrot" measures that reward suppliers for demonstrating climate leadership, versus "stick" approaches that penalize suppliers who have not made sufficient progress. Companies should work with internal stakeholders to determine which measures are feasible within their organization, and how to implement them.

Incentive mechanisms to consider:

- Supplier recognition: Rewarding suppliers that demonstrate leadership, whether publicly or amongst key audiences such as other suppliers, industry peers, and investors
- Supplier scorecards: Defining key performance indicators (KPIs) and metrics that provide a snapshot of supplier performance in a scorecard format, shared with the suppliers and their relevant Sourcing and Procurement contacts. Such KPIs can be integrated into broader supplier performance scorecards if they are used by the business, and reviewed during regular business reviews
- Supplier benchmarking: Sharing anonymized benchmarking reports that show suppliers how they are performing against their peers across key performance metrics. These can be similar to KPIs used in supplier scorecards
- Adding requirements to supplier contracts: Including requirements related to climate action in supplier Codes of Conduct and/or contracts that suppliers must agree to maintain the business relationship
- Business benefits tied to performance: Any measures that reward suppliers' climate performance with more work or preferential business terms, such as longer term contracts or shorter payment terms
- Business penalties: Financial or other business penalties for supplier inaction, such as escalation through Sourcing and Procurement

leadership, less attractive business terms, and - at the most extreme level - contract termination

- Other financial incentives: Leveraging external partners providing financial or business benefits, such as better financing terms or bill discounting

19.9 Additional Factors for Selecting Suppliers Within the Target Boundary

19.9.1 Leverage over Suppliers:

Evaluate how much influence the company has over suppliers and the likelihood that they will respond to the request to set SBTs.

19.9.2 Strategic Status of Suppliers:

Identify strategic suppliers whose business importance may correlate with a willingness to invest in meeting the company's SBT expectations.

19.9.3 Sourcing/Procurement Trends:

Consider fluctuations in the supplier list over the five-year engagement period. Business plans to expand or contract supplier relationships can inform which suppliers to include, such as those currently below the spend threshold but expected to gain more business in future years.

19.9.4 Supplier GHG Program Maturity:

Assess suppliers' GHG program maturity via CDP scores/responses, ESG reports, or other questionnaires. Suppliers with existing SBTs may require minimal engagement, while middle- or low-maturity suppliers may need more support. Progress can be tracked via the SBTi Target Dashboard.

19.9.5 Categorizing Suppliers:

Segment suppliers by product, sourcing, or sector to tailor engagement strategies. For example, retailers might categorize suppliers as Food & Beverage, Apparel & Footwear, Home Furnishings, etc., and prioritize categories based on supplier count, relative emissions, or strategic relevance.

19.9.6 Suppliers' Risk Levels:

Use climate or environmental risk assessments to evaluate the relative risk associated with suppliers, which may influence inclusion in engagement efforts.

19.9.7 Determining the Final Supplier List:

Balance SBTi Scope 3 coverage requirements with business implications of engaging the targeted suppliers. Review and discuss the final list with key stakeholders across Sourcing, Procurement, and other relevant business teams before committing to a supplier engagement goal.

19.10 Identifying Internal Stakeholders

19.10.1 Importance of Stakeholder Identification:

Decisions on supplier engagement targets should not be made solely by sustainability teams. Achieving targets requires the commitment and understanding of all relevant business teams from the outset.

19.10.2 Defining Roles and Responsibilities:

Identify internal stakeholders, understand their perspectives, and define their roles and responsibilities in implementing a supplier engagement program. This ensures clarity in execution and accountability.

19.10.3 Relevant Teams to Engage:

Depending on the company structure and SBT emission categories, the following teams are typically relevant for supply chain-related emissions and supplier engagement targets:

- Senior Leadership

- Sustainability/ESG Teams
- Sourcing and Procurement
- Compliance/Legal
- Product Accounting/Finance

19.10.4 Leadership and Multi-Stakeholder Support:

Senior leaders and key individuals should be engaged during the target evaluation process. A multi-stakeholder team can support program deployment and be held accountable through leadership oversight and performance incentives.

19.11 Team Roles and Responsibilities

19.11.1 ESG & Sustainability

- Role in Supplier Engagement: Initial driver for setting an SBT, technical support and training on GHG emissions and SBTs, calculating and tracking scope 3 emissions.
- Priorities: Driving the company's sustainability performance and implementing associated initiatives, ensuring climate leadership and credibility.
- How to Frame the Initiative: A leading practice in sustainability and GHG management, an opportunity to integrate sustainable practices into the business.

19.11.2 Senior Leadership

- Role in Supplier Engagement: Sign off on SBTs, program oversight and performance tracking, resource enablement.
- Priorities: Business performance and meeting objectives, external stakeholder expectations, company credibility and reputation.
- How to Frame the Initiative: Creating business value, meeting external stakeholder expectations, enhancing leadership on sustainability.

19.11.3 Sourcing & Procurement

- Role in Supplier Engagement: Primary contact for suppliers and managing contracts, integrating supplier expectations and requirements into existing processes, supporting supplier training and accountability.
- Priorities: Streamlining procurement processes, ensuring teams understand supplier expectations and are supported in the process, getting technical support from sustainability teams.
- How to Frame the Initiative: Opportunity to enhance supplier quality, relationships, and collaboration; prioritize folding initiative into existing processes; commitment to deliver training and ongoing support to the team.

19.11.4 Accounting & Finance

- Role in Supplier Engagement: Supplying annual direct and indirect procurement spend data, implementing any financial supplier incentives (i.e., payment terms).
- Priorities: Ensuring no interruptions to supplier business agreements or processes, understanding required data needs and timing.
- How to Frame the Initiative: Present a clear timeline on annual data request and requirements, prioritize folding initiative into existing processes.

19.12 Supplier Engagement Program

19.12.1 Program Implementation

Implementing a supplier engagement program is a team effort. However, there

should be one individual who is the primary program manager to ensure successful progress towards meeting the company's target. Ideally, this individual is embedded within the Sourcing and Procurement team to ensure smooth integration with existing supplier relationship management processes and systems.

19.12.2 Key Roles in the Program

- Program Sponsor and Leadership Stakeholders: Senior oversight of monitoring program progress and helps secure resources and budget.
- Sourcing and Procurement Category Leads/Managers: Primary point of contact for suppliers, managing communications, and fielding questions.
- SBT/GHG Technical Expert: Typically from the sustainability/ESG team; supports internal teams and suppliers on technical SBT requirements.
- Communications Support: Develops supplier-facing communications and potentially supports external reporting of the program's progress.
- Data Management/Analytics Support: Leads or supports supplier data collection, implements solutions, and analyzes supplier data to determine performance and progress.
- Legal: Supports any program component involving contracts, codes of conduct, or other agreements.

19.12.3 Selecting a Supplier Data Collection Solution

To track progress towards supplier engagement targets, companies need an effective supplier information or data-collection solution. This data is critical to building a successful supplier engagement program, enabling target-tracking and visibility into supplier GHG program maturity. This step also gathers primary emissions data that can refine the company's own GHG emissions calculations and reduction tracking in the future.

19.13 Examples of Activity Data and Emission Factors

19.13.1 Activity Data (Input Metrics Used to Calculate Emissions)

- Liters of fuel consumed
- Kilowatt-hours (kWh) of electricity consumed
- Kilograms of material consumed
- Kilometers of distance traveled
- Hours of time operated
- Square meters of area occupied
- Kilograms of waste generated
- Kilograms of product sold
- Quantity of money spent

19.13.2 Emission Factors (Conversion Metrics Applied to Activity Data)

- kg CO_2 emitted per liter of fuel consumed
- kg CO_2 emitted per kWh of electricity consumed
- kg PFC emitted per kg of material consumed
- t CO_2 emitted per kilometer traveled
- kg SF_6 emitted per hour of time operated
- g N_2O emitted per square meter of area
- g CH_4 emitted per kg of waste generated
- kg HFC emitted per kg of product sold
- kg CO_2 emitted per unit of currency spent

19.14 Data Required from Suppliers to Set SBTs

19.14.1 Emission Reduction Target Information

19.14.1.1 Target Status
- Whether the supplier has an emission reduction target
- Options: Yes/No, including options to state that a target is in the process of being developed or planned to be developed within 1–2 years (to provide insight into target status)

19.14.1.2 Target Boundary
- Coverage: Which scopes and emissions categories are covered and whether the target is at the target coverage

19.14.1.3 Target Scope and Coverage
- Portion Covered: What portion of included scopes and categories are covered

19.14.1.4 Target Type
- Type: Absolute, intensity, or engagement

19.14.1.5 Baseline and Target Years
- Baseline Year: The base year from which progress is measured
- Target Year: The year in which the target will be achieved

19.14.1.6 Targeted Reduction/Ambition
- Reduction Goal: The targeted percentage reduction from the baseline
- Provide the option to report an intensity unit if an intensity target is selected (e.g., reduction per unit/currency)

19.14.1.7 Validation
- SBTi Validation: Whether the target has been validated by the Science Based Targets initiative (SBTi)

19.15 Supplier Emissions Data

19.15.1 Total Annual Scope 1 and 2 Emissions
- Scope 1 and 2 emissions broken down by sources (i.e., fuel types)
- Any emission sources excluded from the quantities reported
- Scope 1 and 2 emissions intensity (per selected unit or currency)
- Scope 1 and 2 emissions allocated/apportioned to the customer
- A description of methodologies followed in calculating scope 1 and 2
- Any product-level Life-Cycle Assessment (LCA) data, if available

19.15.2 Total Scope 3 Emissions
- Scope 3 emissions broken down by category
- Any emission sources excluded from the quantities reported across categories
- Scope 3 emissions intensity (per selected unit or currency)
- Scope 3 emissions allocated/apportioned to the customer
- A description of methodologies followed in calculating scope 3 categories
- Which portion of emissions have been third-party verified, if any

19.16 Refining Data Requirements

Once the inventory compiler has selected a data set, unless published data can be used in their original form, the next step is to develop a more formal specification and data request. This formalization enables efficient annual updating (through knowing what to ask for, from whom, and when) while complying with QA/QC requirements for documentation (see Chapter 6, QA/QC and Verification). A clear definition of data requirements ensures that when data are delivered, they meet expectations.

The specification should include details such as:

- Definition of the data set: e.g., time series, sectors and sub-sector detail, national coverage, requirements for uncertainty data, emission factors and/or activity data units
- Definition of format and structure: e.g., spreadsheet format and table structure required
- Description of assumptions: regarding national coverage, sectors included, representative year, technology/management level, and emission factors or uncertainty parameters
- Identification of routines and timescales: e.g., frequency of data set updates and elements updated
- Reference to documentation and QA/QC procedures
- Contact name and organisation
- Date of availability

It can be useful to seek commitment to these specifications from the organisation providing the data. Maintaining and updating these specifications regularly, in case data requirements change, helps document the data sources and provides up-to-date guidance for routine data collection activities. Incorporating early warning routines to detect and manage delays can also be useful.

Measurement objective: A clear statement of the parameter(s) to be determined, e.g., HFC-23 emissions from HCFC-22 production.

19.17 Select a Base Year and Calculate Emissions

19.17.1 Select a Base Year

Companies need to establish a base year to track emissions performance consistently and meaningfully over the target period. The following considerations are important:

19.17.1.1 Accuracy and verifiability: Scope 1, 2, and 3 emissions data should be accurate and verifiable.

19.17.1.2 Representativeness: Base year emissions should be representative of a company's typical GHG profile.

19.17.1.3 Earliest acceptable year: The base year must be no earlier than 2015.

19.17.1.4 Consistency with previous targets: Companies that have already set near-term science-based targets must use the same base year for their long-term SBT.

19.17.1.5 Multiple targets: If more than one target is set, companies should use the same base year for all targets within the target timeframe.

19.17.1.6 Scope 1 and 2 alignment: Scope 1 and scope 2 targets must use the same base year.

19.17.1.7 Scope 3 alignment: Scope 3 targets are recommended but not required to use the same base year as scope 1 and 2 targets. Exceptionally difficult data or historical base years may justify a different base year.

19.17.1.8 Scope 3 consistency: Base years across different scope 3 targets must be the same.

19.17.1.9 Multi-year averages: The SBTi does not accept multi-year average base years unless specified in sector guidance relevant to the company.

19.17.2 Develop a Full GHG Emissions Inventory

Companies are required to have a comprehensive emissions inventory that

covers at least 95% of company-wide scope 1 and 2 GHG emissions and includes a complete scope 3 inventory. Key considerations include:

19.17.2.1 Data Quality: Companies should select the most complete, reliable, and representative data in terms of technology, time, and geography. High-quality primary data from suppliers and other value chain partners should be collected for scope 3 activities that are significant and targeted for GHG reductions. Secondary data is permissible for less significant scope 3 categories but limits performance tracking.

19.17.2.2 Alignment of boundaries: The target boundary must align with the GHG inventory boundary. A single consolidation approach—operational control, financial control, or equity share—must be selected to determine the organizational boundary, calculate the GHG inventory, and define SBT boundaries. The organizational boundary should align with the company's financial reporting.

19.17.2.3 GHG coverage: Both the emissions inventory and target boundary must cover all seven GHGs or classes of GHGs under the UNFCCC and Kyoto Protocol: CO_2, CH_4, N_2O, HFCs, PFCs, SF_6, and NF_3.

19.17.2.4 Complex business relationships: Companies must determine how to treat subsidiaries, joint ventures, and other complex structures. Parent companies are required to include emissions from subsidiary operations according to the selected consolidation approach, regardless of whether the subsidiary has approved SBTs.

19.17.2.5 Importance of scope 3 inventory: A complete scope 3 inventory is critical for identifying emissions hotspots, reduction opportunities, and areas of risk up and down the value chain.

19.18 Set Target Boundaries

19.18.1 Near-Term Science-Based Target Boundary (Scopes 1, 2, and 3)

19.18.1.1 Coverage for scope 1 and 2: Near-term science-based targets must cover at least 95% of company-wide scope 1 and 2 emissions.

19.18.1.2 Coverage for scope 3: When scope 3 emissions represent 40% or more of total emissions (scopes 1, 2, and 3), companies must set one or more emission reduction targets and/or supplier/customer engagement targets that collectively cover at least 67% of total scope 3 emissions, considering the minimum boundary of each category.

19.18.1.3 Sector-specific requirements: Companies in heavy-emitting sectors may be required to include specific emissions sources or scope 3 categories in their SBT boundary.

19.18.1.4 Scope 3 category identification: Using a scope 3 inventory, companies can identify which categories should be included to meet the 67% threshold. Relative importance varies by sector:

- Consumer packaged goods: purchased goods and services (category 1)
- Food processing: purchased goods and services (category 1)
- Logistics: upstream transportation and distribution (category 4)
- Automotive: use of sold products (category 11)
- Electronics: use of sold products (category 11)
- Gas distribution and retail: use of sold products (category 11)
- Chemicals: end-of-life treatment of sold products (category 12)

19.18.2 Long-Term Science-Based Targets

19.18.2.1 Coverage: Must cover at least 95% of company-wide scope 1 and 2 emissions and 90% of scope 3 emissions.

19.18.3 FLAG Targets

19.18.3.1 FLAG sector requirement: Companies in SBTi-designated sectors must set a FLAG-specific target separate from other emissions targets. Designated sectors include:

- Forest and paper products (forestry, timber, pulp and paper, rubber)
- Food production (agricultural and animal source)
- Food and beverage processing
- Food and staples retailing
- Tobacco

19.18.3.2 FLAG threshold for other sectors: Companies in any other sector with FLAG-related emissions totaling more than 20% of overall emissions across scopes 1, 2, and 3 must also set a FLAG-specific target. The 20% threshold is calculated as gross emissions (not net).

19.18.3.3 Land-use change inclusion: Companies meeting either condition must include emissions from land-use change (LUC) using either direct LUC or statistical LUC.

19.18.4 Conduct Scope 3 Screening

19.18.4.1 Purpose: Provides an initial emissions estimate across scope 3 categories to identify the most significant categories, the greatest reduction opportunities, and those most relevant to business goals.

19.18.4.2 Method selection: Companies should identify the GHG estimation method and relevant data owners for each source.

19.18.4.3 Common estimation approaches: Scope 3 screening is typically based on procurement spend data, converted to GHG emissions using Environmentally Extended Input-Output (EEIO) conversions. Other methods, such as industry averages or proxy data, may also be used.

19.19 Determining if a Supplier Engagement Target Is Appropriate

19.19.1 Supply Chain Emissions Overview

19.19.1.1 Category 1 – Purchased Goods and Services: All upstream (cradle-to-gate) emissions from services and products purchased, covering both direct and indirect procurement.

19.19.1.2 Category 2 – Capital Goods: All upstream (cradle-to-gate) emissions from the production of capital goods purchased, such as facilities, buildings, vehicles, and equipment.

19.19.1.3 Category 4 – Upstream Transportation and Distribution: Emissions from third-party transportation and distribution of purchased products.

19.19.2 Engagement Target Parameters

19.19.2.1 Boundary: Engagement targets can be applied across scope 3 categories where the company has credible engagement with supplier activities.

19.19.2.2 Formulation: The target should specify the percentage of emissions covered by the engagement target or, if emissions data is unavailable, the percentage of annual procurement spend covered.

19.19.2.3 Timeframe: Engagement targets must be achieved within five years from the target submission date.

19.19.2.4 Level of Ambition: Suppliers must set targets aligned with the current SBTi Criteria. All new supplier targets reported should comply with the latest criteria updates.

19.19.3 Supplier Expectations

19.19.3.1 Science-Based Targets: Suppliers must set scope 1 and 2 targets aligned with SBTi; inclusion of scope 3 targets is required if these emissions exceed 40% of total supplier emissions.

19.19.3.2 Target Review: Suppliers should confirm alignment with SBTi Criteria and Guidelines. Validation through SBTi is recommended but not mandatory; if unvalidated, the company must establish a review process.

19.19.3.3 Progress Reporting: Suppliers must report progress annually, either publicly or via the company's data collection process.

19.19.4 Additional Considerations for Supplier Selection

19.19.4.1 Leverage Over Suppliers: Assess the company's influence and likelihood of supplier responsiveness to set SBTs.

19.19.4.2 Strategic Status: Strategic suppliers may be more willing to invest in meeting SBT expectations.

19.19.4.3 Sourcing/Procurement Trends: Supplier lists may fluctuate; anticipate changes in spend and business relationships when defining the target list.

19.19.4.4 Supplier GHG Program Maturity: Evaluate maturity through CDP scores, ESG reports, or questionnaires. Higher-maturity suppliers may require less engagement, while middle- or low-maturity suppliers may need more.

19.19.4.5 Categorizing Suppliers: Segment suppliers by product, sourcing, or sector to tailor engagement approaches. Prioritize categories based on supplier count, relative emissions, or strategic relevance.

19.19.4.6 Supplier Risk Levels: Climate or environmental risk assessments can inform which suppliers to engage based on risk exposure.

19.19.5 Finalizing Supplier List

Determining the final list of suppliers requires balancing SBTi scope 3 coverage requirements with business implications. The selection should be reviewed with key stakeholders across Sourcing, Procurement, and other relevant business teams prior to committing to a supplier engagement goal. Best practices for internal alignment are discussed in the next section.

19.20 Identifying Internal Stakeholders

19.20.1 Importance of Stakeholder Engagement

- Decisions on supplier engagement targets should not be made solely by sustainability teams.
- Achieving targets requires commitment and understanding from all relevant business teams.
- Early identification of internal stakeholders, their perspectives, and roles ensures smooth implementation of the supplier engagement program.

19.20.2 Stakeholder Selection Considerations

- Stakeholder selection depends on the company's structure and the SBT emission categories.
- Key questions to consider:
  - Which measures are needed to address scope 3 emissions?

- Which teams must be engaged to implement these measures effectively?

19.20.3 Relevant Teams for Supplier Engagement Targets

19.20.3.1 Senior Leadership: Provides oversight, decision-making, and ensures accountability.

19.20.3.2 Sustainability/ESG Teams: Lead technical aspects, provide guidance, and track performance.

19.20.3.3 Sourcing and Procurement: Manages supplier relationships and implements engagement processes.

19.20.3.4 Compliance/Legal: Ensures alignment with regulatory and contractual requirements.

19.20.3.5 Product Teams: Provide operational input and support for emissions-related initiatives.

19.20.3.6 Accounting/Finance: Supplies procurement and financial data, and supports incentive or reporting mechanisms.

19.20.4 Multi-Stakeholder Team Approach

- Engage senior leaders and key individuals during target evaluation.
- A multi-stakeholder team supports program deployment and is accountable through leadership oversight and performance incentives.

19.21 Reporting Guiding Principles

19.21.1 Importance of Annual Target Reporting

- Annual reporting enables companies to communicate year-on-year progress against targets to stakeholders.
- Disclosure of all relevant aspects ensures stakeholders understand the context, implications, and nuances of the targets.

19.21.2 Core Reporting Principles

19.21.2.1 Relevance: Targets should accurately reflect the company's GHG emissions and meet decision-making needs of both internal and external users.

19.21.2.2 Completeness: Report all GHG emission sources and activities within the target boundary, and disclose any justified exclusions.

19.21.2.3 Consistency: Use consistent methodologies to allow meaningful comparison over time. Transparently document any changes to data, boundaries, methods, or other relevant factors.

19.21.2.4 Transparency: Address all relevant issues factually, disclose assumptions, and reference accounting methods, calculation methodologies, and data sources.

19.21.2.5 Accuracy: Ensure emissions are neither over- nor under-reported, minimize uncertainties, and achieve sufficient precision to enable informed decision-making.

19.21.3 Disclosure of Progress Against Science-Based Targets

Companies should cover the following aspects in their disclosure:

19.21.3.1 GHG Emissions Inventory – full disclosure of emissions data.

19.21.3.2 Target Description – scope, boundaries, and type of targets.

19.21.3.3 Target Progress – progress against set targets.

19.21.3.4 Substantial Emission Variations and Target Changes – explain any significant changes or deviations.

19.21.3.5 Actions Towards Meeting SBTs – describe initiatives and measures undertaken.

19.21.4 Supplier and/or Customer Engagement Targets (Scope 3)

- Engagement targets focus on suppliers or customers representing a percentage of emissions to set their own science-based targets, aligned with the latest SBTi Corporate Near-Term Criteria.
- Can be applied to upstream or downstream scope 3 categories where engagement efforts may reduce emissions.
- Engagement targets can be based on spend data, emissions data, or critical/strategic supplier lists.

19.21.5 Considerations for Spend-Based Targets

- Spend-based targets may not always correlate with the largest GHG emissions; coverage of at least 67% of total scope 3 emissions is essential.

19.21.6 Advantages of Supplier/Customer Engagement Targets

- Enables early action when specific reduction levers are unidentified.
- Drives reduction behaviors that may benefit other customers of the same supplier.
- Encourages collaborative ownership and responsibility for emission reductions.
- Easy to track and monitor progress.

19.21.7 Disadvantages

- Emissions reduction associated with spend-based targets is less clear than emissions-based targets.
- May focus only on scope 1 and 2 emissions of suppliers or customers, limiting the overall scope of reductions.

19.22 Key Considerations in Target Progress Monitoring and Reporting

19.22.1 Methodologies, Assumptions, and Data Sources

- Clearly report the methodologies, assumptions, and data sources used to track annual performance against targets.

19.22.2 Supplier Data Management

- Define a systematic and auditable process for updating and maintaining the supplier list and associated data.

19.22.3 Annual Scope 3 Inventory Updates

- Refresh the scope 3 inventory and related supplier data on an annual basis throughout the target timeframe.

19.22.4 Third-Party Verification

- Consider third-party verification of scope 3 calculations that determine the targeted list of suppliers to ensure accuracy and credibility.

20. QUALITY ASSURANCE / QUALITY CONTROL (QA/QC) AND VERIFICATION

20.1 Balancing Resources, Accuracy, and Cost

Inventory compilers must balance the requirements for improved accuracy and reduced uncertainty against timeliness and cost effectiveness. A good QA/QC and verification system should:

- Optimize resource allocation across categories and the overall compilation process.

- Allocate sufficient time for checking and reviewing emissions and removal estimates.
- Define the frequency and level of QA/QC appropriate for each category.
- Ensure availability and access to activity data, emission factors, and other estimation parameters, including documentation of uncertainties.
- Acquire additional data where required for comparison or verification.
- Maintain confidentiality of sensitive inventory information when necessary.
- Establish requirements for documenting and archiving all QA/QC activities.
- Evaluate whether increased QA/QC effort leads to improved estimates and reduced uncertainties.
- Confirm that sufficient independent data and expertise are available for verification activities.

20.2 Prioritizing QA/QC and Verification Activities

To focus QA/QC and verification efforts on categories requiring intensive analysis, the following questions should guide prioritization:

20.2.1 Category Significance

- Is the category designated as key for qualitative reasons?
- Does the category have high uncertainty in its estimates?
- Have there been significant changes in category characteristics (e.g., technology, management practices)?
- Have estimation methodologies for this category changed recently?
- Are there notable trends in emissions or removals for this category?

20.2.2 Methodology Complexity

- Does the methodology involve complex modeling or large external database inputs?
- Are emission factors or parameters significantly different from recognized IPCC defaults or other inventories?
- Has it been a long time since emission factors or parameters were updated?
- Has it been a long time since the category underwent QA/QC and verification?

20.2.3 Data Management and Overlaps

- Have there been changes in data processing or management platforms, such as database or software updates?
- Is there potential overlap with estimates reported under other categories, which could cause double counting or incomplete estimates?

20.3 Timing of QA/QC Activities

- Intensify QA/QC efforts during inventory cycles when significant changes occur, such as methodology updates or data processing modifications.
- One-time changes may only require intensified QA/QC in the affected cycle.

This structured approach ensures QA/QC and verification resources are targeted effectively, enhancing inventory accuracy and reliability while maintaining operational efficiency.

20.4 Elements of a QA/QC and Verification System

A comprehensive QA/QC and verification system for inventory compilation should include the following elements:

20.4.1 Inventory Compiler Participation

- A designated inventory compiler is responsible for coordinating all QA/QC and verification activities.

- Clearly defined roles and responsibilities within the inventory team ensure accountability and smooth implementation of QA/QC procedures.

20.4.2 QA/QC Plan

- A formal QA/QC plan outlines procedures, timelines, and responsibilities for quality control and verification.

20.4.3 General QC Procedures

- Procedures that apply across all inventory categories to ensure consistency, accuracy, and reliability in data handling and reporting.

20.4.4 Category-Specific QC Procedures

- Targeted procedures tailored to individual categories, addressing unique data sources, estimation methods, and potential uncertainties.

20.4.5 QA and Review Procedures

- Regular checks and reviews at defined stages of inventory compilation to verify data accuracy, completeness, and consistency.

20.4.6 Interaction with Uncertainty Analyses

- Integration of QA/QC activities with uncertainty assessments to identify high-risk data points and prioritize verification efforts.

20.4.7 Verification Activities

- Independent verification steps, including internal or external audits, to confirm the integrity and credibility of inventory estimates.

20.4.8 Reporting, Documentation, and Archiving

- Systematic documentation and archiving of QA/QC processes, findings, and verification results to maintain transparency and enable future audits.

This structured framework ensures a robust and auditable QA/QC system, supporting accurate and reliable inventory reporting while enabling continuous improvement.

20.5 QA/QC Plan

A QA/QC plan is a central component of an effective QA/QC and verification system. It provides a structured approach to ensure inventory data is accurate, reliable, and fit for purpose. The plan should outline all QA/QC and verification activities, as well as the institutional arrangements and responsibilities for implementing them.

20.5.1 Key Features of a QA/QC Plan

- Scope and Activities: Defines the QA/QC and verification activities to be applied throughout the inventory preparation, from initial development through final reporting.
- Responsibilities: Clearly assigns roles and accountability for each QA/QC activity within the organization.
- Scheduled Timeline: Establishes a timeline that aligns QA/QC checks with inventory compilation milestones.
- Internal Reference: Serves as an internal document to guide current and future inventory preparation, with flexibility for modification when processes change or on independent reviewer advice.

20.5.2 Data Quality Objectives

A core component of the QA/QC plan is the establishment of measurable data quality objectives (DQOs) against which the inventory can be evaluated. DQOs should be:

- Appropriate and realistic, considering national circumstances and organizational capacity.
- Designed to support continuous improvement of the inventory.

- Based on key inventory principles:
  - Timeliness
  - Completeness
  - Consistency (internal and time-series)
  - Comparability
  - Accuracy
  - Transparency
  - Improvement

20.5.3 Alignment with ISO Standards

QA/QC plans should reference international quality management standards where relevant. The ISO 14064 series provides guidance for GHG inventory preparation, validation, and verification:

- ISO 14064-1:2006 – Specification with guidance at the organizational level for quantification and reporting of GHG emissions and removals.
- ISO 14064-2:2006 – Specification with guidance at the project level for quantification, monitoring, and reporting of GHG reductions or removals.
- ISO 14064-3:2006 – Specification with guidance for the validation and verification of GHG assertions.

20.5.4 QC Activity

- QC activities are defined within the plan to ensure adherence to data quality objectives and inventory principles.
- Activities include systematic checks, reviews, and documentation to maintain accuracy, consistency, and transparency.

The QA/QC plan provides a structured foundation for reliable GHG inventory compilation and facilitates ongoing improvement and verification.

20.6 Data Validation and Verification System

A structured checklist ensures that data used in GHG inventory compilation is accurate, consistent, and reliable. The checklist focuses on key validation and verification areas:

20.6.1 Documentation and Assumptions

- Ensure all assumptions and selection criteria for activity data, emission factors, and other estimation parameters are fully documented.
- Cross-check that descriptions of activity data, emission factors, and other estimation parameters correspond to the relevant inventory categories and are properly recorded and archived.
- Confirm that all bibliographical references and sources are correctly cited in internal documentation.

20.6.2 Transcription Errors

- Verify that data entry and transcription are accurate:
  - Cross-check a sample of input data from each category, whether measurements or parameters used in calculations, for transcription errors.
  - Reproduce a subset of emissions and removals calculations to ensure integrity.

20.6.3 Emissions and Removals Calculations

- Ensure emissions and removals are calculated correctly:
  - Use simplified approximation methods to cross-verify more complex calculations, confirming no errors in data entry or computation.

        - Check that units are clearly and correctly labelled throughout calculation sheets.

    20.6.4 Parameters and Units

    - Confirm proper recording and application of parameters and units:
        - Ensure units are consistently carried through all calculations.
        - Verify that conversion factors are correct and appropriately applied.
        - Confirm temporal and spatial adjustment factors are applied correctly where required.

    This checklist helps maintain accuracy, transparency, and reliability across the GHG inventory process, providing a clear framework for QA/QC and verification activities.

20.7 General Inventory QC Procedures

    20.7.1 Procedures

    - Consistency Across Categories:
        - Identify parameters such as activity data or constants that are used in multiple categories.
        - Verify that these shared parameters are applied consistently across all relevant emission and removal calculations.

    This step ensures that the inventory maintains internal consistency and avoids discrepancies caused by inconsistent use of common data inputs.

20.8 Data Validation and Verification Checklist

    20.8.1 Inventory Data Movement

    - Verify that inventory data moves correctly through all processing steps.
    - Ensure emissions and removals data are accurately aggregated from lower reporting levels to higher reporting levels for summary purposes.

    20.8.2 Uncertainty Estimates

    - Confirm that uncertainties in emissions and removals are correctly estimated and calculated.
    - Check that the qualifications of individuals providing expert judgment for uncertainty estimates are appropriate.
    - Ensure that all assumptions, expert judgments, and qualifications are properly documented.
    - Verify that calculated uncertainties are complete and accurate.

    20.8.3 Time Series Consistency

    - Verify temporal consistency in time series input data for each category.
    - Ensure consistency in the algorithms or methods used for calculations throughout the time series.
    - Review methodological and data changes that may require recalculations.

20.9 QC Activity Procedures

    20.9.1 Check Completeness

    - Confirm that estimates are reported for all categories and all years, from the appropriate base year to the current inventory period.
    - Ensure that subcategories fully cover their parent category.
    - Provide clear definitions for “Other” type categories.
    - Document known data gaps that result in incomplete estimates, including a qualitative assessment of their impact.
    - Compare current inventory estimates to previous years; investigate and explain any significant changes or deviations from expected trends.

20.9.2 Trend Checks

- Evaluate implied emission factors (aggregate emissions divided by activity data) across the time series.
- Identify any outliers that are unexplained.
- Verify that static values across the time series do not hide changes in emissions or removals.
- Ensure detailed internal documentation exists to support estimates and allow reproduction of emissions, removals, and uncertainty calculations.

20.9.3 Review of Internal Documentation and Archiving

- Confirm that inventory data, supporting data, and records are properly archived and stored for detailed review.
- Ensure the archive is finalized and securely retained following the completion of the inventory.

20.10 QC Checks on Models

Models are often used to extrapolate or interpolate from limited data sets, which requires assumptions and procedural steps. Proper QA/QC is essential to ensure model outputs are reliable and transparent. The inventory compiler should perform the following checks:

20.10.1 Appropriateness of Model Assumptions

- Evaluate the validity of model assumptions, extrapolations, interpolations, calibration modifications, and data characteristics.
- Ensure these assumptions are suitable for the greenhouse gas inventory methods and aligned with national circumstances.

20.10.2 Model Documentation

- Confirm the availability of complete model documentation, including descriptions, assumptions, rationale, scientific evidence, and references supporting the modelling approach and parameters.

20.10.3 QA/QC Procedures Performed by Model Developers

- Review the types and results of QA/QC procedures, including model validation steps performed by developers and data suppliers.
- Document responses to these QA/QC results.

20.10.4 Evaluation and Updating of Assumptions

- Ensure plans are in place to periodically evaluate, update, or replace assumptions with new measurements.
- Key assumptions should be identified through sensitivity analyses.

20.10.5 Completeness

- Verify that model outputs adequately cover all relevant IPCC source/sink categories.

20.11 Comparison and QC of Emission Factors

20.11.1 Comparison with IPCC Default Factors

Inventory compilers should compare country-specific factors with relevant IPCC default emission factors, taking into consideration the characteristics and properties on which the default factors are based. The purpose of this comparison is to determine whether country-specific factors are reasonable, given the similarities or differences between the national source/sink category and the “average” category represented by the defaults. Large differences between country-specific factors and default factors do not necessarily indicate problems, but unexplained differences may point to potential quality issues.

20.11.2 Comparisons of Emission Factors Between Countries

- Between-country emission factor comparisons can be combined with historic trends by plotting, for different countries, the reference year value (e.g., 1990), the most recent year value, and the minimum and maximum values.
- This analysis should be performed for each source/sink category and possible aggregations.
- Comparisons can also be made using aggregate emissions divided by activity data (implied emission factors), which can help detect outliers based on the statistical distribution of values from the sample of countries considered.
- When using between-country comparisons as a QC check, it is important to investigate similarities and differences in national circumstances for the relevant category. If source/sink characteristics differ significantly between countries, the effectiveness of this check is reduced.

20.11.3 Comparison to Plant-Level Emission Factors

- A supplementary step is to compare country-specific factors with site-specific or plant-level factors, if available.
- For example, emission factors for individual plants (even if insufficient for a bottom-up approach) can be compared with the aggregated factor used in the inventory.
- This comparison helps assess the reasonableness and representativeness of the country-specific factor.

20.12 Data Gathering, Input, and Handling Activities: Quality Checks

20.12.1 Transcription and Input Validation

- Check a sample of input data for transcription errors.
- Review spreadsheets using computerized checks and/or quality check reports.
- Identify spreadsheet modifications that provide additional controls or quality checks.
- Check project files for completeness.
- Confirm that bibliographical references are included in spreadsheets for every primary data element.
- Verify that all appropriate citations from spreadsheets appear in the inventory document.
- Check that all citations in spreadsheets and inventory are complete, including all relevant information.
- Randomly check bibliographical citations for transcription errors.
- Ensure that originals of new citations are included in the current docket submittal.
- Randomly check that the originals of citations (including Contact Reports) contain the referenced material and content.

20.12.2 Documentation of Assumptions and Methodology

- Check that assumptions and criteria for selection of activity data, emission factors, and other estimation parameters are documented.
- Verify that changes in data or methodology are documented.
- Ensure that citations in spreadsheets and inventory documents conform to acceptable style guidelines.

20.12.3 Calculation Checks

- Check that all calculations are included, rather than presenting results only.
- Verify that units, parameters, and conversion factors are appropriately presented.
- Ensure units are properly labelled and correctly carried through from beginning to end of calculations.
- Check that conversion factors are correct.
- Verify that temporal and spatial adjustment factors are used correctly.
- Check the relationships between data (comparability) and processing steps (e.g., equations) in spreadsheets.
- Ensure spreadsheet input data and calculated data are clearly differentiated.
- Check a representative sample of calculations, either by hand or electronically.
- Verify some calculations using abbreviated methods.
- Check the aggregation of data within each category.
- When methods or data have changed, check consistency of time series inputs and calculations.
- Compare current year estimates against previous years (if available) and investigate unexplained departures from trends.
- Check the value of implied emission/removal factors across the time series and investigate unexplained outliers.
- Check for any unexplained or unusual trends in activity data or other calculation parameters in time series.
- Ensure consistency with IPCC inventory guidelines and good practices, particularly if changes occur.

20.13 Refining Data Requirements

Once the inventory compiler has selected a data set, the next step is to formalize data requirements to ensure efficient annual updates and compliance with QA/QC documentation standards. This formalization ensures that delivered data meet expectations and supports consistent inventory preparation.

20.13.1 Data Specification

- Definition of the Data Set: Include time series, sector and sub-sector detail, national coverage, requirements for uncertainty data, emission factors, and activity data units.
- Data Format and Structure: Specify the format (e.g., spreadsheet) and structure, detailing the tables and their organization.
- Assumptions: Document assumptions regarding national coverage, included sectors, representative year, technology/management level, and emission factors or uncertainty parameters.
- Collection Routines and Timescales: Identify how often data are updated, what elements are updated, and expected delivery schedules.
- Documentation and QA/QC References: Include references to relevant QA/QC procedures and documentation standards.
- Contact Details: Provide the name and organization of the data provider.
- Date of Availability: Define the expected delivery date of the data.

20.13.2 Implementation Considerations

- Seek commitment from data providers to adhere to the defined specifications.

- Maintain and update specifications regularly to reflect changes in data requirements.
- Implement early warning routines to detect and manage potential delays in data delivery.

20.13.3 Measurement Objective

- Clearly state the parameter(s) to be determined, e.g., HFC-23 emissions from HCFC-22 production, ensuring alignment with inventory goals and QA/QC standards.

21.1 General Information and Scope

Companies shall publicly report the following information to comply with the GHG Protocol Product Standard:

i. Contact Information: Name and details of responsible party.
ii. Product Details: Studied product name and description.
iii. Unit of Analysis and Reference Flow: Define the functional unit or reference flow for the product.
iv. Inventory Type: Cradle-to-grave or cradle-to-gate.
v. Additional GHGs: Any other greenhouse gases included in the inventory.
vi. Product Rules or Sector Guidance: Applicable rules or standards used.
vii. Inventory Date and Version: Date of compilation and version identifier.
viii. Links to Previous Inventories: For subsequent inventories, provide a link to previous reports and describe methodological changes.
ix. Disclaimer: Limitations of potential uses of the report, including for product comparison.

21.1.1 Boundary Setting

a. Life Cycle Stage Definitions: Clearly define and describe each stage included.
b. Process Map: Include attributable processes in the inventory.
c. Non-Attributable Processes: List processes included but not directly attributable.
d. Excluded Processes: Identify excluded attributable processes and provide justification.
e. Cradle-to-Gate Justification: Provide justification if using a cradle-to-gate boundary.
f. Time Period: Specify the reporting period.
g. Land-Use Change Method: Describe the method used to calculate land-use change impacts, if applicable.

21.1.2 Allocation

a. Method Disclosure and Justification: Explain the methods used to avoid or perform allocation for co-products or recycling.
b. Closed-Loop Approximation: Report any displaced emissions and removals separately from the end-of-life stage when using this method.

21.1.3 Data Collection and Quality

- Provide a descriptive statement for significant processes on data sources, data quality, and any improvement efforts.

21.1.4 Uncertainty

- Provide a qualitative statement on inventory uncertainty and methodological choices, including:
  - Use and end-of-life profile
  - Allocation methods, including recycling

- Source of Global Warming Potential (GWP) factors
- Calculation models

21.1.5 Inventory Results

a. GWP Factors: Source and date of factors used.
b. Total Inventory Results: Units of CO2e per unit of analysis, including all emissions and removals from biogenic and non-biogenic sources and land-use change impacts.
c. Percentage by Life Cycle Stage: Proportion of total results per stage.
d. Separate Emissions: Biogenic and non-biogenic emissions/removals separately.
e. Land-Use Impacts: Report separately if applicable.
f. Cradle-to-Gate vs. Gate-to-Gate: Provide results separately or note confidentiality limitations.
g. Carbon Containment: Amount of carbon in the product or components not released during waste treatment.
h. Intermediate Product Carbon: For cradle-to-gate inventories, report carbon contained in intermediate products.

20.2 Assurance

20.2.1 Assurance Statement

The assurance statement shall include:

- Whether the assurance was performed by a first or third party
- Level of assurance achieved (limited or reasonable) and assurance opinion or the critical review findings
- A summary of the assurance process
- The relevant competencies of the assurance providers
- An explanation of how any potential conflicts of interest were avoided for first-party assurance

20.2.2 Setting Reduction Targets and Tracking Inventory Changes

Companies that report a reduction target and/or track performance over time shall report the following:

- The base inventory and current inventory results in the updated inventory report
- The reduction target, if established
- Changes made to the inventory, if the base inventory was recalculated
- The threshold used to determine when recalculation is needed
- Appropriate context identifying and describing significant changes that trigger base inventory recalculation
- The change in inventory results as a percentage change over time between the two inventories on the unit of analysis basis
- An explanation of the steps taken to reduce emissions based on the inventory results

20.2.3 Requirements for Setting Reduction Targets and Tracking

To set reduction targets and track inventory changes over time, companies shall:

- Develop and report a base inventory that conforms with the requirements of this standard
- Recalculate the base inventory when significant changes in the inventory methodology occur and report those changes

- Complete and disclose an updated inventory report including the updated results, the base inventory results, and the context for significant changes
- Use a consistent unit of analysis to enable comparison and track performance over time

20.2.4 Land-Use and Biogenic Material Considerations

For studied products whose life cycle includes biogenic materials (materials produced by living organisms or biological processes, not fossilized or from fossil sources), attributable processes associated with those materials include emissions and removals from agricultural and forestry practices such as growth, fertilizer application, cultivation, and harvesting.

Land-use change impacts may be attributable to a studied product's material acquisition and preprocessing stage and include:

- Biogenic CO2 emissions and removals due to carbon stock change occurring as a result of land conversion within or between land-use categories
- Biogenic and non-biogenic CO2, N2O, and CH4 emissions resulting from the preparation of converted land, such as biomass burning or liming

Guidance is provided for two scenarios: when the specific land that the product or product component originates from is known, and when it is not. The concepts of assessment period, amortization period, and distribution of impacts are applied in both situations.

This guidance is not limited to agricultural and forest products. Any company with a studied product that uses a large amount of land, such as a new settlement, should determine whether land use changed within the assessment period and whether that had any impact on the area's carbon stocks.

21.GREENHOUSE GASES BY ACTIVITIES

21.1 MACHINERY (ISIC 28, 29, 30, 31, 32)
EMISSIONS: CO_2, CH_4, N_2O, NO_x, CO, NMVOC, SO_2
21.2 MINING & QUARRYING (EXCLUDING FUELS, ISIC 13, 14)
EMISSIONS: CO_2, CH_4, N_2O, NO_x, CO, NMVOC, SO_2
21.3 WOOD & WOOD PRODUCTS (ISIC 20)
EMISSIONS: CO_2, CH_4, N_2O, NO_x, CO, NMVOC, SO_2
21.4 CONSTRUCTION (ISIC 45)
EMISSIONS: CO_2, CH_4, N_2O, NO_x, CO, NMVOC, SO_2
21.5 TEXTILE & LEATHER (ISIC 17, 18, 19)
EMISSIONS: CO_2, CH_4, N_2O, NO_x, CO, NMVOC, SO_2
21.6 NON-SPECIFIED INDUSTRY (ISIC 25, 33, 36, 37)
EMISSIONS: CO_2, CH_4, N_2O, NO_x, CO, NMVOC, SO_2
21.7 TRANSPORT (EXCLUDING MILITARY)
EMISSIONS: CO_2, CH_4, N_2O, NO_x, CO, NMVOC, SO_2
21.8 CIVIL AVIATION (INTERNATIONAL + DOMESTIC)
EMISSIONS: CO_2, CH_4, N_2O, NO_x, CO, NMVOC, SO_2
21.9 INTERNATIONAL AVIATION (BUNKERS)
EMISSIONS: CO_2, CH_4, N_2O, NO_x, CO, NMVOC, SO_2

21.10 DOMESTIC AVIATION
EMISSIONS: CO_2, CH_4, N_2O, NO_x, CO, NMVOC, SO_2
21.11 WATER-BORNE NAVIGATION (EXCLUDING FISHING)
EMISSIONS: CO_2, CH_4, N_2O, NO_x, CO, NMVOC, SO_2
21.12 INTERNATIONAL WATER-BORNE NAVIGATION (BUNKERS)
EMISSIONS: CO_2, CH_4, N_2O, NO_x, CO, NMVOC, SO_2
21.13 DOMESTIC WATER-BORNE NAVIGATION
EMISSIONS: CO_2, CH_4, N_2O, NO_x, CO, NMVOC, SO_2
21.14 OTHER TRANSPORT (PIPELINES, AIRPORT/HARBOUR GROUND, OFF-ROAD, EXCL. AGRICULTURE/MANUFACTURING)
EMISSIONS: CO_2, CH_4, N_2O, NO_x, CO, NMVOC, SO_2
21.15 PIPELINE TRANSPORT
EMISSIONS: CO_2, CH_4, N_2O, NO_x, CO, NMVOC, SO_2
21.16 OFF-ROAD TRANSPORT (NON-PIPELINE)
EMISSIONS: CO_2, CH_4, N_2O, NO_x, CO, NMVOC, SO_2
21.17 OTHER SECTORS (OWN-USE COMBUSTION INCL. ELECTRICITY/HEAT)
EMISSIONS: CO_2, CH_4, N_2O, NO_x, CO, NMVOC, SO_2
21.18 COMMERCIAL & INSTITUTIONAL (ISIC 41, 50–52, 55, 63–67, 70–75, 80, 85, 90–93, 99)
EMISSIONS: CO_2, CH_4, N_2O, NO_x, CO, NMVOC, SO_2
21.19 RESIDENTIAL SECTOR
EMISSIONS: CO_2, CH_4, N_2O, NO_x, CO, NMVOC, SO_2
21.20 AGRICULTURE, FORESTRY, FISHING & FISH FARMS (ISIC 01, 02, 05, EXCL. HIGHWAY TRANSPORT)
EMISSIONS: CO_2, CH_4, N_2O, NO_x, CO, NMVOC, SO_2
21.21 WASTEWATER TREATMENT & DISCHARGE (GENERAL)
EMISSIONS: CH_4, N_2O, NO_x, CO, NMVOC
21.22 DOMESTIC WASTEWATER TREATMENT & DISCHARGE
EMISSIONS: CH_4, N_2O, NO_x, CO, NMVOC
21.23 INDUSTRIAL WASTEWATER TREATMENT & DISCHARGE
EMISSIONS: CH_4, N_2O, NO_x, CO, NMVOC
21.24 OTHER WASTE-RELATED ACTIVITIES
EMISSIONS: CO_2, CH_4, N_2O, NO_x, CO, NMVOC
21.25 OTHER (INDIRECT N_2O FROM ATMOSPHERIC DEPOSITION OF NO_x & NH_3)
EMISSIONS: N_2O
21.26 OTHER (UNSPECIFIED ACTIVITIES, EXCEPTIONAL CASES ONLY)
EMISSIONS: (CASE-SPECIFIC, NOT PREDEFINED)
21.27 ENERGY (COMBUSTION & FUGITIVE FUEL RELEASES, EXCL. NON-ENERGY USES)
EMISSIONS: CO_2, CH_4, N_2O, NO_x, CO, NMVOC, SO_2
21.28 FUEL COMBUSTION ACTIVITIES
EMISSIONS: CO_2, CH_4, N_2O, NO_x, CO, NMVOC, SO_2
21.29 ENERGY INDUSTRIES (FUEL EXTRACTION & ENERGY PRODUCTION)
EMISSIONS: CO_2, CH_4, N_2O, NO_x, CO, NMVOC, SO_2
21.30 MAIN ACTIVITY ELECTRICITY & HEAT PRODUCTION (PUBLIC/PRIVATE UTILITIES)
EMISSIONS: CO_2, CH_4, N_2O, NO_x, CO, NMVOC, SO_2
21.31 ELECTRICITY GENERATION (MAIN ACTIVITY PRODUCERS, EXCL. CHP)
EMISSIONS: CO_2, CH_4, N_2O, NO_x, CO, NMVOC, SO_2

21.32 COMBINED HEAT & POWER (CHP) GENERATION (MAIN ACTIVITY PRODUCERS)
EMISSIONS: CO_2, CH_4, N_2O, NO_x, CO, NMVOC, SO_2
21.33 HEAT PLANTS (MAIN ACTIVITY PRODUCERS, HEAT SOLD VIA PIPE NETWORK)
EMISSIONS: CO_2, CH_4, N_2O, NO_x, CO, NMVOC, SO_2
21.34 PETROLEUM REFINING
EMISSIONS: CO_2, CH_4, N_2O, NO_x, CO, NMVOC, SO_2
21.35 MANUFACTURE OF SOLID FUELS & OTHER ENERGY INDUSTRIES (INCL. ON-SITE USE, CHARCOAL, BIOFUELS, COAL/OIL/GAS EXTRACTION & PROCESSING, PRE-COMBUSTION CO_2 CAPTURE)
EMISSIONS: CO_2, CH_4, N_2O, NO_x, CO, NMVOC, SO_2
21.36 MANUFACTURE OF SOLID FUELS (COKE, BROWN COAL BRIQUETTES, PATENT FUEL)
EMISSIONS: CO_2, CH_4, N_2O, NO_x, CO, NMVOC, SO_2
21.37 OTHER ENERGY INDUSTRIES (OWN-USE COMBUSTION NOT ELSEWHERE CLASSIFIED)
EMISSIONS: CO_2, CH_4, N_2O, NO_x, CO, NMVOC, SO_2
21.38 MANUFACTURING INDUSTRIES & CONSTRUCTION (GENERAL FUEL COMBUSTION, EXCL. COKE OVENS & INDUSTRY TRANSPORT)
EMISSIONS: CO_2, CH_4, N_2O, CO, NMVOC, SO_2
21.39 IRON & STEEL (ISIC 271, 2731)
EMISSIONS: CH_4, N_2O, CO, NMVOC, SO_2
21.40 NON-FERROUS METALS (ISIC 272, 2732)
EMISSIONS: CH_4, N_2O, CO, NMVOC, SO_2
21.41 CHEMICALS (ISIC 24)
EMISSIONS: CO_2, CH_4, N_2O, CO, NMVOC, SO_2
21.42 PULP, PAPER & PRINT (ISIC 21, 22)
EMISSIONS: CO_2, CH_4, N_2O, CO, NMVOC, SO_2
21.43 FOOD PROCESSING, BEVERAGES & TOBACCO (ISIC 15, 16)
EMISSIONS: CO_2, CH_4, N_2O, CO, NMVOC, SO_2
21.44 NON-METALLIC MINERALS (GLASS, CERAMIC, CEMENT; ISIC 26)
EMISSIONS: CO_2, CH_4, N_2O, CO, NMVOC, SO_2
21.45 TRANSPORT EQUIPMENT (ISIC 34, 35)
EMISSIONS: CO_2, CH_4, N_2O, CO, NMVOC, SO_2
21.46 SODA ASH PRODUCTION
EMISSIONS: CO_2, CH_4, N_2O, NO_x, CO, NMVOC
21.47 PETROCHEMICAL & CARBON BLACK PRODUCTION
- 21.47.1 METHANOL (FOSSIL FEEDSTOCKS, EXCL. BIOGENIC)
  EMISSIONS: CO_2, CH_4, N_2O, NMVOC
- 21.47.2 ETHYLENE (STEAM CRACKING, EXCL. REFINERY ETHYLENE)
  EMISSIONS: CO_2, CH_4, N_2O, NO_x, CO, NMVOC, SO_2
- 21.47.3 ETHYLENE DICHLORIDE & VINYL CHLORIDE MONOMER
  EMISSIONS: CO_2, CH_4, N_2O, NMVOC
- 21.47.4 ETHYLENE OXIDE
  EMISSIONS: CO_2, CH_4, N_2O, NO_x, CO, NMVOC, SO_2
- 21.47.5 ACRYLONITRILE
  EMISSIONS: CO_2, CH_4, N_2O, NMVOC
- 21.47.6 CARBON BLACK
  EMISSIONS: CO_2, CH_4, N_2O, NO_x, CO, NMVOC, SO_2

21.48 FLUOROCHEMICAL PRODUCTION
EMISSIONS: HFCS, PFCS, SF_6, OTHER HALOGENATED GASES
21.49 AMMONIA PRODUCTION
EMISSIONS: CO_2 (PRIMARY), CH_4, N_2O, NO_x, CO, NMVOC, SO_2
21.50 NITRIC ACID PRODUCTION
EMISSIONS: N_2O (PRIMARY), CO_2, CH_4, NO_x, CO, NMVOC
21.51 ADIPIC ACID PRODUCTION
EMISSIONS: N_2O (PRIMARY), CO_2, CH_4, NO_x
21.52 CAPROLACTAM, GLYOXAL & GLYOXYLIC ACID PRODUCTION
EMISSIONS: N_2O (PRIMARY), CO_2, CH_4, NO_x, CO, NMVOC
21.53 CARBIDE PRODUCTION (SILICON CARBIDE, CALCIUM CARBIDE)
EMISSIONS: CO_2, CH_4, CO, SO_2, NO_x, NMVOC
21.54 TITANIUM DIOXIDE, SYNTHETIC RUTILE & TITANIUM SLAG PRODUCTION
EMISSIONS: CO_2 (PRIMARY), CH_4, N_2O, NO_x, CO, NMVOC
21.55 OTHER PRODUCT MANUFACTURE & USE
- 21.55.1 ELECTRICAL EQUIPMENT (SF_6 IN GIS, TRANSFORMERS, BREAKERS, ETC.)
  EMISSIONS: SF_6, PFCS, HALOGENATED GASES
- 21.55.2 OTHER USES (MILITARY RADAR, PARTICLE ACCELERATORS, HEAT TRANSFER FLUIDS, COSMETICS, MEDICAL APPLICATIONS, TRACER STUDIES)
  EMISSIONS: SF_6, PFCS

21.56 NITROUS OXIDE PRODUCT USES
- 21.56.1 MEDICAL (ANAESTHETIC, CARRIER GAS FOR ISOFLURANE, SEVOFLURANE, DESFLURANE; VETERINARY; ANALGESIC)
  EMISSIONS: N_2O
- 21.56.2 FOOD INDUSTRY (AEROSOL PROPELLANT, WHIPPED CREAM DISPENSERS)
  EMISSIONS: N_2O
- 21.56.3 MISCELLANEOUS PRODUCT USES
  EMISSIONS: N_2O

21.57 UNSPECIFIED PRODUCT USES
EMISSIONS: CO_2, CH_4, N_2O, HFCS, PFCS, SF_6, OTHER HALOGENATED GASES
21.58 OTHER PRODUCT MANUFACTURE & USE
- 21.58.1 ELECTRICAL EQUIPMENT (GIS, TRANSFORMERS, BREAKERS, INSULATED LINES)
  EMISSIONS: SF_6, PFCS, HALOGENATED GASES
- 21.58.2 OTHER USES (MILITARY RADAR, PARTICLE ACCELERATORS, ADIABATIC APPLICATIONS, SOUND-PROOF GLAZING, HEAT TRANSFER FLUIDS, COSMETICS, MEDICAL USES, TRACER STUDIES)
  EMISSIONS: SF_6, PFCS

21.59 FUGITIVE EMISSIONS – NATURAL GAS SYSTEMS
- 21.59.1 PRODUCTION (WELLHEAD TO PROCESSING PLANTS; SERVICING, GATHERING, PROCESSING, WASTE/ACID GAS DISPOSAL)
  EMISSIONS: CO_2, CH_4, NMVOC
- 21.59.2 PROCESSING FACILITIES (EXCLUDING VENTING/FLARING)
  EMISSIONS: CO_2, CH_4, NMVOC
- 21.59.3 TRANSMISSION & STORAGE (PIPELINES, INDUSTRIAL DELIVERY, DISTRIBUTION NETWORKS, STORAGE, NGL EXTRACTION)
  EMISSIONS: CO_2, CH_4, NMVOC

21.59.4 DISTRIBUTION (END-USER DELIVERY, EXCLUDING VENTING/ FLARING)
EMISSIONS: CO_2, CH_4, NMVOC
21.59.5 OTHER (BLOWOUTS, PIPELINE RUPTURES, DIG-INS)
EMISSIONS: CO_2, CH_4, NMVOC
21.60 OTHER FUGITIVE EMISSIONS (ENERGY PRODUCTION: GEOTHERMAL, PEAT, NON-FOSSIL SOURCES)
EMISSIONS: CO_2, CH_4, N_2O, NO_x, CO, NMVOC, SO_2
21.61 CARBON DIOXIDE TRANSPORT & STORAGE (CCS)
21.61.1 TRANSPORT (PIPELINES, SHIPS, STORAGE SYSTEMS – LEAKS, VENTING, ACCIDENTAL RELEASES)
EMISSIONS: CO_2
21.61.2 INJECTION & STORAGE (WELL SITE LEAKS, UNDERGROUND CONTAINMENT LEAKS)
EMISSIONS: CO_2
21.62 FUGITIVE EMISSIONS FROM FUELS (EXTRACTION, PROCESSING, STORAGE, TRANSPORT)
EMISSIONS: CO_2, CH_4, N_2O, NO_x, CO, NMVOC, SO_2
21.62.1 SOLID FUELS – UNDERGROUND MINING (ACTIVE MINING, POST-MINING, ABANDONED MINES, DEGASIFICATION, VENTILATION AIR)
EMISSIONS: CH_4, CO_2
21.62.2 SOLID FUELS – SURFACE MINING (COAL SEAM BREAKAGE, STRATA LEAKAGE, POST-MINING, STORAGE, UNCONTROLLED COAL DUMP COMBUSTION)
EMISSIONS: CO_2, CH_4, N_2O, NO_x, CO, NMVOC, SO_2
21.62.3 SOLID FUEL TRANSFORMATION (SECONDARY/TERTIARY COAL PRODUCTS)
EMISSIONS: CO_2, CH_4, N_2O, NO_x, CO, NMVOC, SO_2
21.63 FUGITIVE EMISSIONS – OIL & NATURAL GAS SYSTEMS (EXPLORATION, PRODUCTION, TRANSMISSION, REFINING, UPGRADING, DISTRIBUTION)
EMISSIONS: CO_2, CH_4, N_2O, NO_x, CO, NMVOC
21.63.1 OIL SYSTEMS – VENTING (ASSOCIATED/WASTE GAS RELEASES)
EMISSIONS: CO_2, CH_4
21.63.2 OIL SYSTEMS – FLARING (COMBUSTION OF WASTE GAS)
EMISSIONS: CO_2, CH_4, N_2O, NO_x
21.63.3 OTHER OIL OPERATIONS (STORAGE TANKS, PIPELINES, BLOWOUTS, LANDFARMS, GAS MIGRATION, TAILINGS PONDS)
EMISSIONS: CO_2, CH_4, N_2O, NO_x, CO, NMVOC
21.64 OTHER LAND USE & AGRICULTURE
21.64.1 LAND USE (FOREST LAND, CROPLAND, GRASSLAND, WETLANDS, SETTLEMENTS, OTHER LAND)
EMISSIONS: CO_2, CH_4, N_2O, CO, NMVOC, SO_2
21.64.2 LIVESTOCK & MANURE MANAGEMENT
EMISSIONS: CH_4, N_2O
21.64.3 MANAGED SOILS, LIMING & UREA APPLICATION
EMISSIONS: CO_2, N_2O
21.64.4 HARVESTED WOOD PRODUCTS (HWP)
EMISSIONS/REMOVALS: CO_2
21.65 INDUSTRY-SPECIFIC

21.65.1 PULP & PAPER INDUSTRY
EMISSIONS: CO_2, CH_4, N_2O, CO, NMVOC, SO_2
21.65.2 FOOD & BEVERAGES INDUSTRY
EMISSIONS: CO_2, CH_4, N_2O, CO, NMVOC, SO_2
21.65.3 OTHER UNSPECIFIED ACTIVITIES
EMISSIONS: CO_2, CH_4, N_2O, CO, NMVOC, SO_2

21.66 LIVESTOCK EMISSIONS
EMISSIONS: CH_4, N_2O
21.66.1 ENTERIC FERMENTATION
EMISSIONS: CH_4
21.66.1.1 CATTLE
EMISSIONS: CH_4
21.66.1.1.1 DAIRY COWS – CH_4
21.66.1.1.2 OTHER CATTLE – CH_4
21.66.1.2 BUFFALO – CH_4
21.66.1.3 SHEEP – CH_4
21.66.1.4 GOATS – CH_4
21.66.1.5 CAMELS – CH_4
21.66.1.6 HORSES – CH_4
21.66.1.7 MULES & ASSES – CH_4
21.66.1.8 SWINE – CH_4
21.66.1.9 OTHER LIVESTOCK (ALPACAS, LLAMAS, DEER, REINDEER, ETC.) – CH_4
21.66.2 MANURE MANAGEMENT
EMISSIONS: CH_4, N_2O
21.66.2.1 CATTLE
EMISSIONS: CH_4, N_2O
21.66.2.1.1 DAIRY COWS – CH_4, N_2O
21.66.2.1.2 OTHER CATTLE – CH_4, N_2O
21.66.2.2 BUFFALO – CH_4, N_2O
21.66.2.3 SHEEP – CH_4, N_2O
21.66.2.4 GOATS – CH_4, N_2O
21.66.2.5 CAMELS – CH_4, N_2O
21.66.2.6 HORSES – CH_4, N_2O
21.66.2.7 MULES & ASSES – CH_4, N_2O
21.66.2.8 SWINE – CH_4, N_2O
21.66.2.9 POULTRY (CHICKENS, BROILERS, TURKEYS, DUCKS) – CH_4, N_2O
21.66.2.10 OTHER LIVESTOCK (ALPACAS, LLAMAS, DEER, REINDEER, FUR-BEARING ANIMALS, OSTRICHES, ETC.) – CH_4, N_2O

21.67 LAND EMISSIONS AND REMOVALS
EMISSIONS: CO_2, CH_4, N_2O, CO, NMVOC, SO_2
21.67.1 FOREST LAND
EMISSIONS: CO_2, CH_4, N_2O, CO, NMVOC, SO_2
21.67.1.1 FOREST LAND REMAINING FOREST LAND – CO_2, CH_4, N_2O, CO, NMVOC, SO_2
21.67.1.2 LAND CONVERTED TO FOREST LAND – CO_2, CH_4, N_2O, CO, NMVOC, SO_2

21.67.1.2.1 CROPLAND CONVERTED TO FOREST LAND – CO_2, CH_4, N_2O, CO, NMVOC, SO_2
21.67.1.2.2 GRASSLAND CONVERTED TO FOREST LAND – CO_2, CH_4, N_2O, CO, NMVOC, SO_2
21.67.2 FLOODED LAND
EMISSIONS: CO_2, CH_4, N_2O, CO, NMVOC, SO_2
21.67.2.1 FLOODED LAND REMAINING FLOODED LAND – CO_2, CH_4, N_2O, CO, NMVOC, SO_2
21.67.2.2 LAND CONVERTED TO WETLANDS – CO_2, CH_4, N_2O, CO, NMVOC, SO_2
21.67.2.2.1 LAND CONVERTED FOR PEAT EXTRACTION – CO_2, CH_4, N_2O, CO, NMVOC, SO_2
21.67.2.2.2 LAND CONVERTED TO FLOODED LAND – CO_2, CH_4, N_2O, CO, NMVOC, SO_2
21.67.2.2.3 LAND CONVERTED TO OTHER WETLANDS – CO_2, CH_4, N_2O, CO, NMVOC, SO_2
21.67.3 SETTLEMENTS
EMISSIONS: CO_2, CH_4, N_2O, CO, NMVOC, SO_2
21.67.3.1 SETTLEMENTS REMAINING SETTLEMENTS – CO_2
21.67.3.2 LAND CONVERTED TO SETTLEMENTS
EMISSIONS: CO_2
21.67.3.2.1 FOREST LAND CONVERTED TO SETTLEMENTS – CO_2
21.67.3.2.2 CROPLAND CONVERTED TO SETTLEMENTS – CO_2
21.67.3.2.3 GRASSLAND CONVERTED TO SETTLEMENTS – CO_2
21.67.3.2.4 WETLANDS CONVERTED TO SETTLEMENTS – CO_2
21.67.3.2.5 OTHER LAND CONVERTED TO SETTLEMENTS – CO_2
21.68 OTHER LAND
EMISSIONS: CO_2
21.68.1 OTHER LAND REMAINING OTHER LAND – CO_2
21.69 LEAD PRODUCTION
EMISSIONS: CO_2
21.70 ZINC PRODUCTION
EMISSIONS: CO_2
21.71 OTHER (UNSPECIFIED ACTIVITIES)
EMISSIONS: CO_2, CH_4, N_2O, HFCS, PFCS, SF_6, OTHER HALOGENATED GASES, CO, NMVOC, SO_2
21.72 NON-ENERGY PRODUCTS FROM FUELS AND SOLVENT USE
EMISSIONS: CO_2, CH_4, N_2O, CO, NMVOC, SO_2
21.72.1 LUBRICANT USE – CO_2
21.72.2 PARAFFIN WAX USE – CO_2, CH_4, N_2O
21.72.3 SOLVENT USE – NMVOC
21.72.4 OTHER USES (E.G., ASPHALT PRODUCTION, CHEMICAL PRODUCTS) – CO_2, CH_4, N_2O, CO, NMVOC, SO_2

21.73 ELECTRONICS INDUSTRY
EMISSIONS: CO_2, CH_4, N_2O, PFCS, HFCS, SF_6, OTHER HALOGENATED GASES
- 21.73.1 INTEGRATED CIRCUIT / SEMICONDUCTOR MANUFACTURING – CO_2, N_2O, PFCS, HFCS, SF_6, OTHER HALOGENATED GASES

21.74 PRODUCT USES AS SUBSTITUTES FOR OZONE-DEPLETING SUBSTANCES (ODS)
EMISSIONS: HFCS, PFCS, SF_6, OTHER HALOGENATED GASES
- 21.74.1 REFRIGERATION AND AIR CONDITIONING – HFCS, PFCS
- 21.74.2 FOAM BLOWING AGENTS – HFCS, PFCS
- 21.74.3 FIRE EXTINGUISHERS – HFCS, PFCS, SF_6
- 21.74.4 AEROSOLS AND METERED DOSE INHALERS (MDIS) – HFCS, PFCS
- 21.74.5 SOLVENTS – HFCS, PFCS
- 21.74.6 OTHER APPLICATIONS – HFCS, PFCS, SF_6, OTHER HALOGENATED GASES

21.75 OTHER PRODUCT MANUFACTURE AND USE
EMISSIONS: CO_2, N_2O, CH_4, HFCS, PFCS, SF_6, OTHER HALOGENATED GASES
- 21.75.1 ELECTRICAL EQUIPMENT – SF_6
- 21.75.2 N_2O FROM PRODUCT USES (E.G., MEDICAL, PROPELLANTS) – N_2O
- 21.75.3 OTHER PRODUCT USES (MISCELLANEOUS) – CO_2, CH_4, N_2O, HFCS, PFCS, SF_6, OTHER HALOGENATED GASES

21.76 INDIRECT N_2O EMISSIONS FROM NITROGEN DEPOSITION
EMISSIONS: N_2O
21.77 PRODUCT USES AS SUBSTITUTES FOR OZONE-DEPLETING SUBSTANCES (ODS)
EMISSIONS: HFCS, PFCS, SF_6, OTHER HALOGENATED GASES
- 21.77.1 REFRIGERATION AND AIR CONDITIONING – HFCS, PFCS
- 21.77.2 FOAM BLOWING AGENTS – HFCS, PFCS
- 21.77.3 FIRE EXTINGUISHERS – HFCS, PFCS, SF_6
- 21.77.4 AEROSOLS – HFCS, PFCS
- 21.77.5 SOLVENTS – HFCS, PFCS
- 21.77.6 ELECTRICAL EQUIPMENT (INSULATION/DIELECTRIC) – SF_6, PFCS

21.78 WASTE MANAGEMENT ACTIVITIES – CO_2, CH_4, N_2O, CO, NMVOC, SO_2
21.79 SOLID WASTE DISPOSAL – CH_4, N_2O, CO_2, NMVOC
21.80 MANAGED WASTE DISPOSAL SITES – CH_4, N_2O, CO_2, NMVOC
21.81 UNMANAGED WASTE DISPOSAL SITES – CH_4, N_2O, CO_2, NMVOC
21.82 UNCATEGORISED WASTE DISPOSAL SITES – CH_4, N_2O, CO_2, NMVOC
21.83 BIOLOGICAL TREATMENT OF SOLID WASTE – CH_4, N_2O, CO_2, NMVOC
21.84 INCINERATION AND OPEN BURNING OF WASTE – CO_2, CH_4, N_2O, CO, NMVOC
21.85 WASTE INCINERATION – CO_2, CH_4, N_2O, CO, NMVOC
21.86 OPEN BURNING OF WASTE – CO_2, CH_4, N_2O, CO, NMVOC
21.87 FUEL COMBUSTION IN AGRICULTURE, FORESTRY, FISHING, AND OTHER SECTORS – CO_2, CH_4, N_2O, NO_x, CO, NMVOC, SO_2

21.87.1 STATIONARY (PUMPS, GRAIN DRYING, GREENHOUSES, FISHING) – CO_2, CH_4, N_2O, NO_x, CO, NMVOC, SO_2
21.87.2 OFF-ROAD VEHICLES AND OTHER MACHINERY – CO_2, CH_4, N_2O, NO_x, CO, NMVOC, SO_2
21.87.3 FISHING (MOBILE COMBUSTION) – CO_2, CH_4, N_2O, NO_x, CO, NMVOC, SO_2
21.87.4 NON-SPECIFIED FUEL COMBUSTION (INCLUDING MILITARY, NOT IN MULTILATERAL OPS) – CO_2, CH_4, N_2O, NO_x, CO, NMVOC, SO_2
21.87.5 STATIONARY (OTHER SOURCES) – CO_2, CH_4, N_2O, NO_x, CO, NMVOC, SO_2
21.87.6 MOBILE (VEHICLES, MACHINERY, MARINE, AVIATION NOT ELSEWHERE SPECIFIED) – CO_2, CH_4, N_2O, NO_x, CO, NMVOC, SO_2
21.87.7 MOBILE (AVIATION COMPONENT) – CO_2, CH_4, N_2O, NO_x, CO, NMVOC, SO_2
21.87.8 MOBILE (WATER-BORNE COMPONENT) – CO_2, CH_4, N_2O, NO_x, CO, NMVOC, SO_2
21.87.9 MOBILE (OTHER) – CO_2, CH_4, N_2O, NO_x, CO, NMVOC, SO_2
21.87.10 MULTILATERAL OPERATIONS (AIR & MARINE, UN CHARTER) – CO_2, CH_4, N_2O, NO_x, CO, NMVOC, SO_2

21.88 ROAD TRANSPORT – CO_2, CH_4, N_2O, NO_x, CO, NMVOC, SO_2
21.88.1 PASSENGER CARS (≤12 PERSONS, INCL. 3-WAY CATALYSTS) – CO_2, CH_4, N_2O, NO_x, CO, NMVOC, SO_2
21.88.2 LIGHT-DUTY TRUCKS (≤3500–3900 KG, INCL. 3-WAY CATALYSTS) – CO_2, CH_4, N_2O, NO_x, CO, NMVOC, SO_2
21.88.3 HEAVY-DUTY TRUCKS AND BUSES (>3500–3900 KG, >12 PERSONS) – CO_2, CH_4, N_2O, NO_x, CO, NMVOC, SO_2
21.88.4 MOTORCYCLES (≤680 KG, ≤3 WHEELS) – CO_2, CH_4, N_2O, NO_x, CO, NMVOC, SO_2
21.88.5 EVAPORATIVE EMISSIONS (HOT SOAK, RUNNING LOSSES, ETC.) – CO_2, CH_4, N_2O, NO_x, CO, NMVOC, SO_2
21.88.6 UREA-BASED ADDITIVES IN CATALYTIC CONVERTERS – CO_2
21.88.7 RAILWAY TRANSPORT (FREIGHT & PASSENGER) – CO_2, CH_4, N_2O, NO_x, CO, NMVOC, SO_2
21.89 FUGITIVE EMISSIONS FROM OIL SYSTEMS (EXCLUDING VENTING & FLARING) – CO_2, CH_4, NMVOC
21.89.1 OIL WELL DRILLING, DRILL STEM TESTING, WELL COMPLETIONS – CO_2, CH_4, NMVOC
21.89.2 OIL PRODUCTION (WELL SERVICING, SANDS/SHALE MINING, EXTRACTION, UPGRADING) – CO_2, CH_4, NMVOC
21.89.3 OIL TRANSPORT (TO UPGRADERS & REFINERIES: PIPELINES, TANKERS, TRUCKS, RAIL) – CO_2, CH_4, NMVOC
21.89.4 PETROLEUM REFINERIES – CO_2, CH_4, NMVOC
21.89.5 OIL PRODUCT TRANSPORT & DISTRIBUTION (TERMINALS, RETAIL FACILITIES) – CO_2, CH_4, NMVOC
21.89.6 OTHER OIL FUGITIVE EMISSIONS (SPILLS, WASTE OIL TREATMENT/DISPOSAL) – CO_2, CH_4, NMVOC

21.90 FUGITIVE EMISSIONS FROM NATURAL GAS SYSTEMS
21.90.1 EXPLORATION, PRODUCTION, PROCESSING, TRANSMISSION, STORAGE, DISTRIBUTION (EXCLUDING VENTING & FLARING) – CO_2,

CH_4, NMVOC

21.90.2 VENTING (NATURAL GAS & WASTE GAS/VAPOUR STREAMS) – CO_2, CH_4, N_2O, NO_x, CO, NMVOC, SO_2

21.90.3 FLARING (NATURAL GAS & WASTE GAS/VAPOUR STREAMS) – CO_2, CH_4, N_2O, NO_x, CO, NMVOC, SO_2

21.90.4 EQUIPMENT LEAKS, STORAGE LOSSES, PIPELINE BREAKS, BLOWOUTS, GAS MIGRATION, OTHER RELEASES – CO_2, CH_4, NMVOC, SO_2

21.91 INDUSTRIAL PROCESSES & PRODUCT USE (EXCLUDING ENERGY & FUEL PROCESSING) – CO_2, CH_4, N_2O, HFCS, PFCS, SF_6, OTHER HALOGENATED GASES, NO_x, CO, NMVOC, SO_2

21.91.1 CEMENT PRODUCTION – CO_2, CH_4

21.91.2 LIME PRODUCTION – CO_2, CH_4

21.91.3 GLASS PRODUCTION – CO_2, CH_4, N_2O, NMVOC, SO_2

21.91.4 CARBONATES IN PRODUCTS (BRICKS, TILES, CERAMICS, ABRASIVES, ETC.) – CO_2, CH_4

21.91.5 SODA ASH USE (E.G., IN GLASS PRODUCTION) – CO_2, CH_4, N_2O, NO_x, CO, NMVOC, SO_2

21.91.6 NON-METALLURGICAL MAGNESIA PRODUCTION – CO_2, CH_4

21.91.7 MISCELLANEOUS CARBONATE USES (EXCL. FLUXES IN METALS & CHEMICALS) – CO_2, CH_4, N_2O, NO_x, CO, NMVOC, SO_2

21.92 FOAMS (USE OF HFCS AS SUBSTITUTES FOR CFCS & HCFCS) – CO_2, HFCS, PFCS, SF_6, OTHER HALOGENATED GASES

21.92.1 CLOSED-CELL FOAM (INSULATING BOARDS, PANELS, PIPE SECTIONS, SPRAYED SYSTEMS, GAP-FILLING FOAMS) – CO_2, HFCS, PFCS, SF_6, OTHER HALOGENATED GASES

21.92.2 OPEN-CELL FOAM (INTEGRAL SKIN PRODUCTS, E.G., AUTOMOTIVE PARTS) – CO_2, HFCS, PFCS, SF_6, OTHER HALOGENATED GASES

21.92.3 IN-USE AND END-OF-LIFE EMISSIONS (DECOMMISSIONING LOSSES) – CO_2, HFCS, PFCS, SF_6, OTHER HALOGENATED GASES

21.93 FIRE PROTECTION (SUBSTITUTES FOR HALONS) – CO_2, HFCS, PFCS, SF_6, OTHER HALOGENATED GASES

21.93.1 PORTABLE (STREAMING) EQUIPMENT – CO_2, HFCS, PFCS, SF_6, OTHER HALOGENATED GASES

21.93.2 FIXED (FLOODING) EQUIPMENT – CO_2, HFCS, PFCS, SF_6, OTHER HALOGENATED GASES

21.94 AEROSOLS – HFCS, PFCS, OTHER HALOGENATED GASES

21.94.1 PROPELLANTS (PERSONAL CARE, HOUSEHOLD, INDUSTRIAL PRODUCTS, MDIS) – HFCS, PFCS, OTHER HALOGENATED GASES

21.94.2 SOLVENTS (INDUSTRIAL AEROSOLS) – HFCS, PFCS, OTHER HALOGENATED GASES

21.95 SOLVENT USE (SUBSTITUTES FOR OZONE-DEPLETING SUBSTANCES) – HFCS, PFCS, OTHER HALOGENATED GASES

21.95.1 PRECISION CLEANING – HFCS, PFCS, OTHER HALOGENATED GASES
21.95.2 ELECTRONICS CLEANING – HFCS, PFCS, OTHER HALOGENATED GASES
21.95.3 METAL CLEANING – HFCS, PFCS, OTHER HALOGENATED GASES
21.95.4 DEPOSITION APPLICATIONS – HFCS, PFCS, OTHER HALOGENATED GASES

21.96 MISCELLANEOUS NICHE APPLICATIONS (SUBSTITUTES FOR ODS) – CO_2, CH_4, N_2O, NO_x, CO, HFCS, PFCS, SF_6, OTHER HALOGENATED GASES
21.96.1 ELECTRONICS TESTING – CO_2, CH_4, N_2O, NO_x, CO, HFCS, PFCS, SF_6, OTHER HALOGENATED GASES
21.96.2 HEAT TRANSFER APPLICATIONS – CO_2, CH_4, N_2O, NO_x, CO, HFCS, PFCS, SF_6, OTHER HALOGENATED GASES
21.96.3 DIELECTRIC FLUID APPLICATIONS – CO_2, CH_4, N_2O, NO_x, CO, HFCS, PFCS, SF_6, OTHER HALOGENATED GASES
21.96.4 MEDICAL APPLICATIONS – CO_2, CH_4, N_2O, NO_x, CO, HFCS, PFCS, SF_6, OTHER HALOGENATED GASES

21.97 PHOTOVOLTAIC CELL MANUFACTURING – CF_4, C_2F_6, OTHER HALOGENATED GASES

21.98 HEAT TRANSFER FLUIDS IN IC MANUFACTURING, TESTING & ASSEMBLY – CO_2, CH_4, N_2O, HFCS, PFCS, SF_6, OTHER HALOGENATED GASES

21.99 REFRIGERATION & AIR CONDITIONING – CO_2, HFCS, PFCS, SF_6, OTHER HALOGENATED GASES
21.99.1 DOMESTIC REFRIGERATION – CO_2, HFCS, PFCS, SF_6, OTHER HALOGENATED GASES
21.99.2 COMMERCIAL REFRIGERATION – CO_2, HFCS, PFCS, SF_6, OTHER HALOGENATED GASES
21.99.3 INDUSTRIAL PROCESSES – CO_2, HFCS, PFCS, SF_6, OTHER HALOGENATED GASES
21.99.4 STATIONARY AIR CONDITIONING – CO_2, HFCS, PFCS, SF_6, OTHER HALOGENATED GASES
21.99.5 TRANSPORT REFRIGERATION – CO_2, HFCS, PFCS, SF_6, OTHER HALOGENATED GASES
21.99.6 MOBILE AIR CONDITIONING – CO_2, HFCS, PFCS, SF_6, OTHER HALOGENATED GASES

22. ENVIRONMENTAL DISCLOSURE QUESTIONNAIRE

22.1 Basic Questions

22.1.1 List the countries/areas in which your organization operates.
22.1.2 Which activities does your organization undertake, and which industry sectors does it work with? Please mention types of clients and types of industries your organization invests in.
22.1.3 List any greenhouse gas emissions and/or water-related impacts arising from the production, processing/manufacturing, distribution activities, or the consumption of your products.

22.1.4 Which part of the concrete value chain does your organization operate in?
22.1.5 Which part of the coal value chain does your organization operate in?
22.1.6 Which part of the chemicals value chain does your organization operate in?
22.1.7 Which real estate and/or construction activities does your organization engage in?
22.1.8 Which part of the electric utilities value chain does your organization operate in?
22.1.9 Do you have captive/grid-based electricity generation? If yes, mention source and capacity.
22.1.10 Which part of the metals and mining value chain does your organization operate in?
22.1.11 Provide details of the mining projects covered by this disclosure, specifying project type, location, and mining methods used.
22.1.12 Which part of the oil and gas value chain does your organization operate in?
22.1.13 Which part of the steel value chain does your organization operate in?
22.1.14 For which transport modes will you be providing data?
22.1.15 Provide details of the commodities that you produce and/or source.
22.1.16 List the agricultural commodities that are most significant to your business by revenue.
22.1.17 Has your organization mapped its value chain (e.g., supplier tier list, supplier industries, etc.)?
22.1.18 Has your organization mapped where in your operations or value chain plastics are produced, commercialized, used, and/or disposed of?
22.1.19 Which commodities has your organization mapped in your upstream supply chain?
22.1.20 Does your organization identify and classify potential water pollutants that may adversely affect water ecosystems or human health?
22.1.21 Provide details on tailings dams management procedures (W-MM/CO only).

- By river basin, how many active and inactive dams are under your control?
- Do you evaluate and classify dams by their potential consequences on human health and ecosystems?

22.1.22 Have you identified any environmental risks with substantive effects on your organization in the reporting year or anticipated in the future? If yes, provide details.
22.1.23 Does your organization invest in low-carbon R&D related to sector activities? Include stage of investment, % revenue invested, and product use cases.

- Cement production (last 3 years)
- Capital goods (last 3 years)
- Chemicals (last 3 years)
- Metals and mining (last 3 years)
- Steel production (last 3 years)
- Real estate and construction (last 3 years)
- Transport activities (last 3 years)
- General sector activities (last 3 years)

22.1.24 Has your organization implemented any environmental initiatives prompted by CDP Supply Chain member engagement? If yes, specify the

members and describe the initiatives.
22.1.25 Does your organization conduct methane leak detection and repair (LDAR) for coal mining? If not, explain why and whether you plan to implement such measures.
22.1.26 Does your organization conduct methane LDAR for oil and gas production?
22.1.27 Does your organization assess the life cycle emissions of its products/services? (e.g., Cradle-to-gate, Cradle-to-grave, Cradle-to-cradle, Gate-to-gate, Use stage, End-of-life).
22.1.28 Provide the total weight of plastic waste generated, indicating the share (%) of reuse, recycling, and composting.
22.1.29 Does your organization operate in or near biodiversity-sensitive areas (e.g., UNESCO sites, Ramsar sites, Key Biodiversity Areas)?
22.1.30 Have any of your projects caused or have potential to cause adverse biodiversity impacts? If yes, provide details.
22.1.31 For mining projects, disclose:

- Total project area (hectares)
- Area of land disturbed
- Significant biodiversity impacts and responses

22.1.32 Provide details on monitoring/estimating your deforestation and conversion footprint.
22.1.33 Is your organization supporting or implementing ecosystem restoration projects? If yes, provide extent, duration, monitoring frequency, and measured outcomes.
22.1.34 Provide details of your organization's emissions to water (e.g., nitrates, phosphates, pesticides, priority substances).
22.1.35 Does your organization have plastics-related targets? If yes, specify type(s).
22.1.36 Indicate which plastics-related activities your organization engages in:

- Production/commercialization of plastic polymers/converters
- Durable plastic goods/components (incl. mixed materials)
- Usage of durable plastics
- Plastic packaging (production/commercialization)
- Products packaged in plastics
- Services using plastic packaging (e.g., food services)
- Waste/water management services
- Financial products/services linked to plastics activities

22.2 Questions for Emissions Disclosed Parties

22.2.1 Has your organization undergone any structural changes in the reporting year (or are prior changes reflected in this disclosure)?
22.2.2 Has your emissions accounting methodology, boundary, or reporting year definition changed?
22.2.3 Have your base year emissions or past year emissions been recalculated due to changes or errors?
22.2.4 Which standards/protocols/methodologies have you used to collect activity data and calculate emissions?
22.2.5 Describe your approach to reporting Scope 1, Scope 2, and Scope 3 emissions.
22.2.6 Are there any sources of emissions (facilities, GHG types, activities,

geographies) within your boundary that are excluded from disclosure? If yes, provide details.
22.2.7 Provide your base year timeline and base year emissions.
22.2.8 What are your organization's gross global Scope 1 emissions (tCO_2e)?
22.2.9 What are your gross global Scope 2 emissions (tCO_2e)?
22.2.10 What are your gross global Scope 3 emissions (tCO_2e)? Explain exclusions, if any.
22.2.11 Disclose or restate your Scope 1–3 emissions data for previous years.
22.2.12 Indicate the verification/assurance status of reported emissions.
22.2.13 Allocate your emissions to customers based on goods/services sold in this period.
22.2.14 What are the challenges in allocating emissions to customers, and what would help overcome these challenges?
22.2.15 Do you plan to develop capabilities for emissions allocation to customers in the future?
22.2.16 Select the energy-related activities your organization undertakes.
22.2.17 Report your total energy consumption (excluding feedstocks) in MWh.
22.2.18 State how much fuel (excluding feedstocks) your organization has consumed in MWh, broken down by fuel type.
22.2.19 Report fuel consumption specifically for cement production activities (MWh).
22.2.20 Provide details on electricity, heat, steam, and cooling generated and consumed in the reporting year.
22.2.21 Provide details of the same for:

- Cement production
- Chemical production
- Metals and mining production
- Steel production

22.2.22 Provide details of your renewable electricity purchases by country/area.
22.2.23 Provide details of your low-carbon heat, steam, and cooling purchases by country/area.
22.2.24 Provide details of your renewable electricity generation by country/area.
22.2.25 Does your organization manage net zero carbon buildings? If yes, provide details.
22.2.26 Provide details of the net zero carbon buildings under your management in the reporting year.
22.2.27 Has your organization retired project-based carbon credits in the reporting year? If yes, specify type of mitigation and reason for retirement.

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