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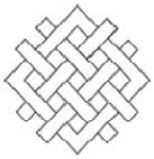


WORLD RESOURCES INSTITUTE

The Greenhouse Gas Protocol Initiative

the foundation for sound and sustainable climate strategies

Guidance for Calculating Scope 3 Emissions

Calculation Guidance for Implementing the *GHG Protocol Corporate Value Chain (Scope 3) Accounting & Reporting Standard*

DRAFT FOR PUBLIC COMMENT

August 2011

Table of Contents

Introduction

This document provides guidance on calculating scope 3 emissions. It is a companion document to the *GHG Protocol Corporate Value Chain (Scope 3) Accounting and Reporting Standard* (hereinafter the "*Scope 3 Standard*"). To help companies quantify their scope 3 emissions, this document provides additional information not contained in the *Scope 3 Standard*, such as methods for calculating GHG emissions for each of the fifteen scope 3 categories, data sources, and worked examples.

This document contains calculation guidance only. All requirements and guidance related to scope 3 accounting and reporting are included in the *Scope 3 Standard*.

Companies calculating scope 3 emissions should refer to the relevant chapters of the *Scope 3 Standard* throughout this document where appropriate. In particular, companies should refer to Chapter 7, which provides guidance on collecting data, and Chapter 8, which provides guidance on allocating emissions – both of which are directly relevant to calculating scope 3 emissions.

0.1 Descriptions of Scope 3 Categories

The *Scope 3 Standard* categorizes scope 3 emissions into 15 distinct categories, as detailed in Figure 1.1. The categories are intended to provide companies with a systematic framework to organize, understand, and report on the diversity of scope 3 activities within a corporate value chain. The categories are designed to be mutually exclusive, such that there is no double counting of emissions between categories.

Table 1.2 includes descriptions of each of the 15 categories that comprise scope 3 emissions. The *Scope 3 Standard* requires companies to separately quantify and report scope 3 emissions by scope 3 category.

Figure 1.1: Overview of Scopes and Emissions Across the Value Chain

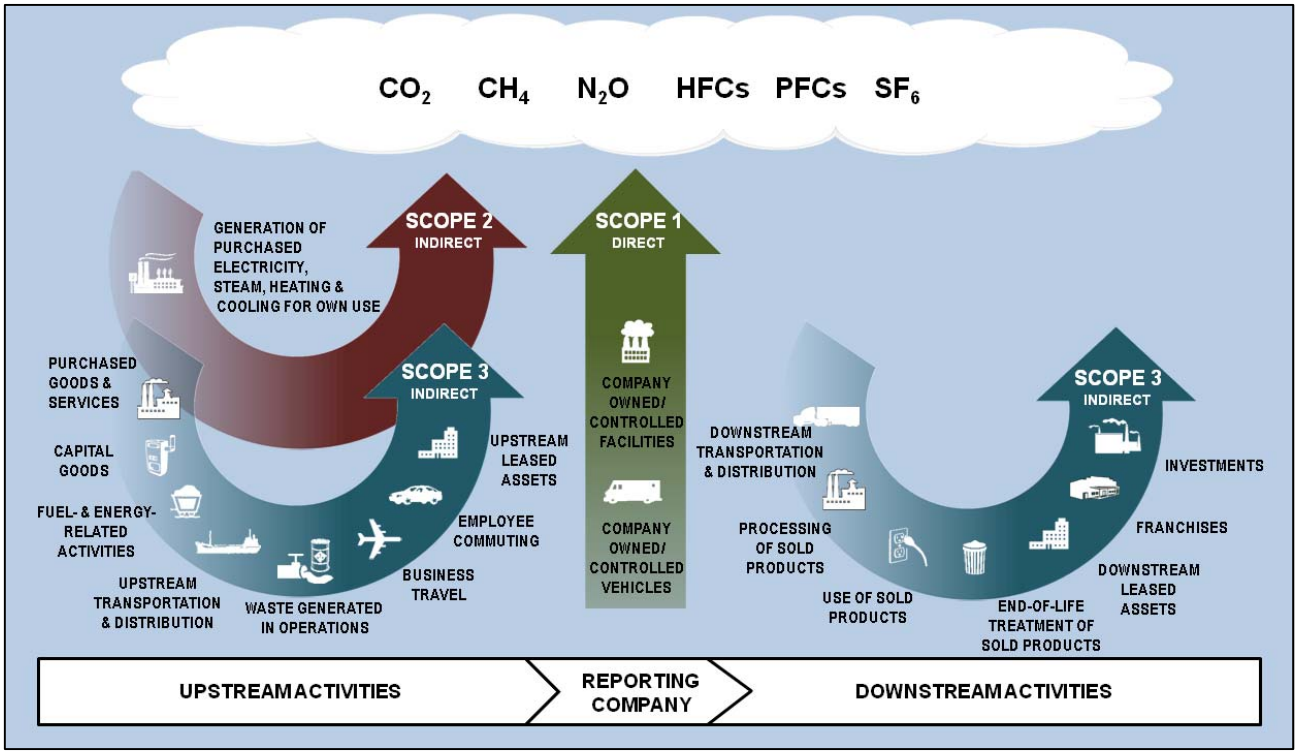


Table 1.2 (from the *Scope 3 Standard)*: Description of Scope 3 Categories

	Category	Category Description	Minimum Boundary
Upstream scope 3 emissions	1. Purchased goods and services	• Extraction, production, and transportation of goods and services purchased or acquired by the reporting company in the reporting year, not otherwise included in Categories 2 - 8	• All upstream (cradle-to-gate) emissions of purchased goods and services
	2. Capital goods	• Extraction, production, and transportation of capital goods purchased or acquired by the reporting company in the reporting year	• All upstream (cradle-to-gate) emissions of purchased capital goods
	3. Fuel- and energy-related activities (not included in scope 1 or scope 2)	• Extraction, production, and transportation of fuels and energy purchased or acquired by the reporting company in the reporting year, not already accounted for in scope 1 or scope 2: A. Upstream emissions of purchased fuels (extraction, production, and transportation of fuels consumed by the reporting company) B. Upstream emissions of purchased electricity (extraction, production, and transportation of fuels consumed in the generation of electricity, steam, heating, and cooling consumed by the reporting company) C. Transmission and distribution (T&D) losses (generation of electricity, steam, heating and cooling that is consumed (i.e., lost) in a T&D system) – reported by end user D. Generation of purchased electricity that is sold to end users (generation of electricity, steam, heating, and cooling that is purchased by the reporting company and sold to end users) – reported by utility company or energy retailer only	A. For upstream emissions of purchased fuels: All upstream (cradle-to-gate) emissions of purchased fuels (from raw material extraction up to the point of, but excluding combustion) B. For upstream emissions of purchased electricity: All upstream (cradle-to-gate) emissions of purchased fuels (from raw material extraction up to the point of, but excluding, combustion by a power generator) C. For T&D losses: All upstream (cradle-to-gate) emissions of energy consumed in a T&D system, including emissions from combustion D. For generation of purchased electricity that is sold to end users: Emissions from the generation of purchased energy
	4. Upstream transportation and distribution	• 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) • 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)	• 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). • Optional: The life cycle emissions associated with manufacturing vehicles, facilities, or infrastructure.
	5. Waste generated in operations	• 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)	• The scope 1 and scope 2 emissions of waste management suppliers that occur during disposal or treatment • Optional: Emissions from transportation of waste
	6. Business travel	• Transportation of employees for business-related activities during the reporting year (in vehicles not owned or operated by the reporting company)	• The scope 1 and scope 2 emissions of transportation carriers that occur during use of vehicles (e.g., from energy use) • Optional: The life cycle emissions associated with manufacturing vehicles or infrastructure

	7. Employee commuting	• Transportation of employees between their homes and their worksites during the reporting year (in vehicles not owned or operated by the reporting company)	• The scope 1 and scope 2 emissions of employees and transportation providers that occur during use of vehicles (e.g., from energy use) • Optional: Emissions from employee teleworking
	8. Upstream leased assets	• 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	• 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) • Optional: The life cycle emissions associated with manufacturing or constructing leased assets
Downstream scope 3 emissions	9. Downstream transportation and distribution	• 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)	• 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) • Optional: The life cycle emissions associated with manufacturing vehicles, facilities, or infrastructure
	10. Processing of sold products	• Processing of intermediate products sold in the reporting year by downstream companies (e.g., manufacturers)	• The scope 1 and scope 2 emissions of downstream companies that occur during processing (e.g., from energy use)
	11. Use of sold products	• End use of goods and services sold by the reporting company in the reporting year	• 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; and GHGs and products that contain or form GHGs that are emitted during use) • Optional: The indirect use-phase emissions of sold products over their expected lifetime (i.e., from the use of products that indirectly consume energy (fuels or electricity) during use
	12. End-of-life treatment of sold products	• Waste disposal and treatment of products sold by the reporting company (in the reporting year) at the end of their life	• The scope 1 and scope 2 emissions of waste management companies that occur during disposal or treatment of sold products
	13. Downstream leased assets	• 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	• The scope 1 and scope 2 emissions of lessees that occur during operation of leased assets (e.g., from energy use). • Optional: The life cycle emissions associated with manufacturing or constructing leased assets
	14. 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
	15. Investments	• Operation of investments (including equity and debt investments and project finance) in the reporting year, not included in scope 1 or scope 2	• See the description of category 15 (Investments) in section 15 for the required and optional boundaries

0.2 How to use this document

Each category first outlines the types of activity data and emissions factors needed in order to calculate emissions. The category then provides data collection guidance and the calculation formula. Finally, the categories provide alternative methodologies (if applicable) and links to further resources. Each scope 3 category follows the structure outlined below:

- Category description
- Activity data needed
- Emission factors needed
- Data collection guidance
- Calculation formula
- Alternative methods (if applicable)
- Calculation resources (if applicable)
- Summary of calculation methods

Chapter 7 (Collecting Data) of the *Scope 3 Standard* provides explanations and examples of activity data and emissions factors.

The *Scope 3 Standard* requires companies to account for CO_2, CH_4, N_2O, HFCs, PFCs, and SF_6, where applicable. The table below presents the applicable greenhouse gases for each of the 15 categories.

	Category	Applicable GHGs
Upstream Scope 3 Emissions	1. Purchased goods & services	CO_2, CH_4, N_2O, HFCs, PFCs, SF_6
	2. Capital goods	CO_2, CH_4, N_2O, HFCs, PFCs, SF_6
	3. Fuel- and energy- related activities not included in scope 1 or scope 2	CO_2, CH_4, N_2O, SF_6
	4. Upstream transportation and distribution	CO_2, CH_4, N_2O, HFCs, PFCs
	5. Waste generated in operations	CO_2, CH_4, N_2O
	6. Business travel	CO_2, CH_4, N_2O
	7. Employee commuting	CO_2, CH_4, N_2O
	8. Upstream leased assets	CO_2, CH_4, N_2O, HFCs, PFCs, SF_6
Downstream Scope 3 Emissions	9. Downstream transportation and distribution	CO_2, CH_4, N_2O, HFCs, PFCs
	10. Processing of sold products	CO_2, CH_4, N_2O, HFCs, PFCs, SF_6
	11. Use of sold products	CO_2, CH_4, N_2O, HFCs, PFCs, SF_6
	12. End-of-life treatment of sold products	CO_2, CH_4, N_2O
	13. Downstream leased assets	CO_2, CH_4, N_2O, HFCs, PFCs, SF_6
	14. Franchises	CO_2, CH_4, N_2O, HFCs, PFCs, SF_6
	15. Investments	CO_2, CH_4, N_2O, HFCs, PFCs, SF_6

0.3 Overview of Calculation Methods

0.3.1 Overview

In most cases, each scope 3 category has multiple calculation methods. Methods that yield the highest quality data may require the most time and effort to collect data. Companies should decide which calculation method to use for each emissions activity within the inventory based on a number of considerations such as:

- The company's business goals and intended use of the scope 3 inventory (for more information, refer to Chapter 2 of the *Scope 3 Standard*)
- The expected contribution of a scope 3 category or activity to the company's total anticipated scope 3 emissions
    - Significance should be determined through an initial estimation or screening step (see Chapter 7 of the *Scope 3 Standard* on prioritizing data collection efforts)
- The relevance of various scope 3 categories or activities based on other criteria (see table below)
- Data availability
- Other criteria identified by the company

Criteria	Description
Influence	There are potential emissions reductions that could be undertaken or influenced by the company
Risk	They contribute to the company's risk exposure (e.g., climate change related risks such as financial, regulatory, supply chain, product and technology, compliance/litigation, and reputational risks)
Stakeholders	They are deemed critical by key stakeholders (e.g., customers, suppliers, investors or civil society)
Outsourcing	They are outsourced activities previously performed in-house or activities outsourced by the reporting company that are typically performed in-house by other companies in the reporting company's sector
Other	They meet any additional criteria developed by the company or industry sector

0.3.2 Using a combination of calculation methods

Almost all companies will use a combination of calculation methods across the inventory and even within each scope 3 category.

Example: Using a combination of calculation methods

Significance of contribution should drive the accuracy sought:

- A company's supply chain incorporates 10 distinct transport steps as part of the overall transport emissions inventory
- If one transport step represents around 60% of total transport emissions, the company may seek to calculate this using detailed primary activity data and high quality emissions factors.
- If the next five transport steps represent around 10% of total emissions between them, the company may seek to calculate using secondary data.

Companies should take practical approaches to reduce costs and complexity without overly compromising quality. This includes:

- Applying more accurate data/calculations for large contributors
- Applying less accurate data/calculations for small contributors
- Grouping or combining activity data (e.g. goods and services) that are similar
- Obtaining data from representative samples and extrapolating the results to the whole
- Use of proxy techniques

GHG Protocol Publications and Tools

Several GHG publications and calculation tools may be useful to calculate emissions from various scope 3 categories. In particular, several cross-sector and sector-specific calculation tools are available on the *GHG Protocol* website (www.ghgprotocol.org), which provide step-by-step guidance together with electronic worksheets to help companies calculate GHG emissions from specific sources or sectors.

GHG Protocol Publication Available at http://www.ghgprotocol.org
GHG Protocol Corporate Accounting and Reporting Standard
GHG Protocol Corporate Value Chain (Scope 3) Accounting and Reporting Standard
GHG Protocol Product Life Cycle Accounting and Reporting Standard
Hot Climate, Cool Commerce: A Service sector Guide to Greenhouse Gas Management
Working 9 to 5: A Guide for Small Office – based Organizations
GHG Protocol for Project Accounting
Guidance for Quantifying GHG Reductions from Grid – Connected Electricity Projects
Land Use, Land–Use Change and Forestry Guidance for GHG Project Accounting

GHG Protocol Emissions Calculation Tools Available at http://www.ghgprotocol.org
Cross Sector Tools
GHG Emissions from Stationary Combustion
GHG Emissions from Purchased Electricity, Heat, or Steam
GHG Emissions from Transport or Mobile Sources
Emissions from Employee Commuting
Measurement and Estimation of Uncertainty of GHG Emissions
Allocation of Emissions from a Combined Heat and Power Plant
Compilation of Emission Factors Used in Cross Sector Tools
Sector Specific Calculation Tools
GHG Emissions from the Production of Aluminum
CO2 Emissions from the Production of Cement (US EPA)
CO2 Emissions from the Production of Iron and Steel
CO2 Emissions from the Production of Lime
CO2 Emissions from the Production of Ammonia
CO2 Emissions from the Production of Cement
N2O Emissions from the Production of Nitric Acid
HFC–23 Emissions from the Production of HCFC-22
GHG Emissions from Pulp and Paper Mills
N2O Emissions from the production of Adipic Acid
HFC and PFC emissions from the manufacturing, installation, operation and disposal of refrigeration and air-conditioning equipment
PFC emissions from the production of semiconductor wafers
GHG emissions from wood products facilities

0.4 Sampling

Where a company has a large quantity of data to collect for a particular category, it may not be practical to collect data from each individual activity. Therefore, companies may use appropriate sampling techniques when collecting data that will represent all activities, by extrapolating from a representative sample.

Companies may also choose to categorize activities into similar groups for data collection. The grouping strategy should group activities with similar anticipated emissions intensities. For example:

- Companies with a large number of leased assets (Categories 8 and 13) or franchises (Category 14) may group buildings by building type and vehicles by vehicle type.
- Companies with a large number of employees collecting data on employee commuting (Category 7) may wish to extrapolate data from a representative sample of employees.
- Companies with a large number of distribution channels may need to use sampling when calculating the emissions associated with Categories 4 and 9 (Transportation and Distribution).

Some level of data sampling will be necessary where it is not practical, or possible, to collect data for all activities within the selected boundaries of the value chain.

Companies should choose a sampling method that aligns with their business goals and document and justify this choice. The choice of sampling method will depend on factors including, but not limited to:

- Available resources
- Number of data points
- Expected level of homogeneity between samples
- Geographical spread of data points
- Ease of data collection
- Timeframe available

Ultimately, the use of sampling and specific choice of sampling method aims to optimise the trade-off between cost and accurately representing all emission sources in the scope 3 category. Companies may use a variety of sampling methods – as appropriate for each specific emissions activity.

0.4.1 Sampling methods

Popular sampling methods available to companies include, but are not limited to:

- Simple Random Sampling
- Systematic Sampling
- Stratified Sampling

Alternative methods for sampling may be equally appropriate.

A brief summary of the three sampling methods noted above are outlined below. Companies using this guidance may find additional information in any statistical publication, or via an internet search.

0.4.1.1 Simple Random Sampling

Simple random sampling involves randomly selecting activities from an entire population.

If the population is small, simple random sampling may be performed at its most basic level by selecting activities at random from the total population. If the population is large, for example with hundreds or thousands of activities in the population, then random sampling can be easily performed by computer.

Advantages of simple random sampling include:

- With an appropriate sample size (see 0.4.2 Sample Size), simple random sampling creates a representative view of the entire population

- As described above, it is relatively straight forward to construct the sample

Disadvantages of simple random sampling include:

- The sample size needed to generate appropriately representative results may be prohibitively large and cumbersome to sample
- e.g. If a retail organisation has thousands of stores in many countries around the globe, randomly selecting individual stores may result in a difficult and time-consuming data collection process
- It may not be possible to obtain a complete list of all activities from the sample size, which is a prerequisite for simple random sampling
- e.g. If a distribution company wanted to determine the average backhaul capacity of its trucks, it would have to list every journey before a random sample could be selected

0.4.1.2 Systematic Sampling

Systematic sampling involves randomly selecting the first item to sample and then selecting subsequent activities at regular intervals.

An appropriate sampling interval should be chosen such that the company achieves the desired sample size. For example, if a company sourced agricultural products from 100 farms but only wanted to sample 20 farms, an appropriate sampling interval would be every 5 farms. If the first farm to be sampled was picked as Farm 3, the company would subsequently sample from Farms 8, 13, 18, 23,…, 93, 98.

Selecting an appropriate systematic sampling interval
Sampling interval = total population size / desired sample size

Advantages of systematic sampling include:

- Simple to implement
- The population is guaranteed to be evenly sampled without risk that the sample points are ‘clustered’ together

Disadvantages of systematic sampling include:

- If there is a periodic pattern in the population to be sampled, this could lead to biased sampling
- As for simple random sampling, it may not be possible to obtain a complete list of all activities in the population

0.4.1.3 Stratified Sampling

Stratified sampling initially groups the population activities into categories with similar characteristics. Random sampling is subsequently performed within these homogeneous groups.

The company should initially create population groups containing activities with characteristics likely to offer similar intensities of GHG emissions. Grouping variables could include; location, size, building type, manufacturing technique, age, etc.

For example, if an agricultural produce company was assessing emissions from its farms, it may use the following variable to create initial grouping of all farms: high / low rainfall; less than 100ha / greater than 100ha; north-facing-hill/south-facing-hill/neither.

Stratified sampling is particularly useful when the variability in GHG emissions within groups is minimized, but the variability between groups is maximised.

Advantages of stratified sampling:

- Can lead to higher precision because there is less variability within the groups given that similar characteristics are grouped together
- The necessary sample size can be reduced due to lower variability within groups, therefore saving time and money

- Allows companies to draw insights into the source and level of emissions between different groups. This level of detail may be lost with simple random sampling
- Different random sampling techniques may be employed between different groups as appropriate

Disadvantages of stratified sampling:

- Identifying appropriate variables and forming sampling groups may be difficult and complex

0.4.2 Sample Size

Determining sample size is fundamental to any sampling activity. The choice of sample size will be influenced by several factors, including the likely significance of GHG emissions from the sources in question, the size of the population, the variability of the emission sources, and the necessary degree of precision.

0.4.3 Level of precision

The extent of precision is related to the sample size, sampling strategy and the measurement system. Increasing the sample size will reduce the sampling error using the relationship $v = \sqrt{n}$. It is important that an estimate of measurement uncertainty is obtained, particularly for parts of the assessment that contribute significantly to the organisation and/ or if subsequent investment decisions are made based upon such measurement.

0.4.4 Confidence level

An estimate of the uncertainty, which should include both precision and bias from random error and systematic error respectively, will enable an interpretation of the measurement. For example, a level of uncertainty of ±5% would imply for an emissions estimate of 100 tonnes CO2e, that the actual emissions lie somewhere between 95 and 105 tonnes CO2e. The confidence level associated with the uncertainty normally corresponds to a 95% confidence level i.e. 2 standard deviations. For example, the true value lies in the range of 95 and 105 tonnes with 95% confidence.

0.4.5 Variability

Variability refers to the degree of difference between activities within the population. A population that is more heterogeneous (more variable) will require a larger sample size. A variability of 50% is the maximum level of variability in a population. Therefore, a variability assumption of 0.5 is often used as a conservative estimate.

0.4.6 Determining sample size

There are several approaches to determining sample size. In particular, four alternative approaches may prove useful for companies:

- Using the sample size of a similar project
- Using online calculators
- Using published tables
- Using formulas

0.4.6.1 Using the sample size of a similar project

Companies may refer to similar projects for guidance on appropriate sample size and sampling technique. When using this approach, companies should justify the similarity and appropriateness for the comparison.

0.4.6.2 Using online calculators

Online calculators are a quick and easy way to assess sample size.

For example:

- http://www.research-advisors.com/tools/SampleSize.htm provides a downloadable spreadsheet to calculate necessary sample size with the ability to tailor the sampling criteria
- http://www.surveysystem.com/sscalc.htm provides an interactive online calculator for sample size, however the choices for confidence level are fixed

0.4.6.3 Using published tables

There are many published tables that give the necessary sample size for a specific set of criteria. Such criteria include precision, confidence levels, and variability for a given population size.

Users should refer to standard statistics texts or search online for a table matching their specific sampling criteria.

0.4.6.4 Using formulas

Companies who want greater assurance for their choice of sample size may turn to established formulas. Formulas for the calculation of sample size are well established and available in all standard statistics and sampling texts, as well as via the internet.

When applying sample size formulas, users may find it advantageous to seek the advice of a person with experience of statistics.

Category 1: Purchased Goods and Services

Category Description

This category includes all upstream (i.e., cradle-to-gate) emissions from the production of products purchased or acquired by the reporting company in the reporting year. Products include both goods (tangible products) and services (intangible products).

This category includes emissions from all purchased goods and services not otherwise included in the other categories of upstream scope 3 emissions (i.e., category 2 through category 8). Specific categories of upstream emissions are separately reported in category 2 through category 8 to enhance the transparency and consistency of scope 3 reports.

Cradle-to-gate emissions include all emissions that occur in the life cycle of purchased products, up to the point of receipt by the reporting company (excluding emissions from sources that are owned or controlled by the reporting company). Cradle-to-gate emissions may include:

- Extraction of raw materials
- Agricultural activities
- Land use and land-use change[1]
- Manufacturing, production, and processing
- Generation of electricity consumed by upstream activities
- Disposal/treatment of waste generated by upstream activities
- Transportation of materials and products between suppliers
- Any other activities prior to acquisition by the reporting company

For more guidance on how to categorize purchased goods and services, refer to Chapter 4 of the *Scope 3 Standard*.

Calculating Emissions from Purchased Goods and Services

This guidance provides calculation methods to calculate emissions from:

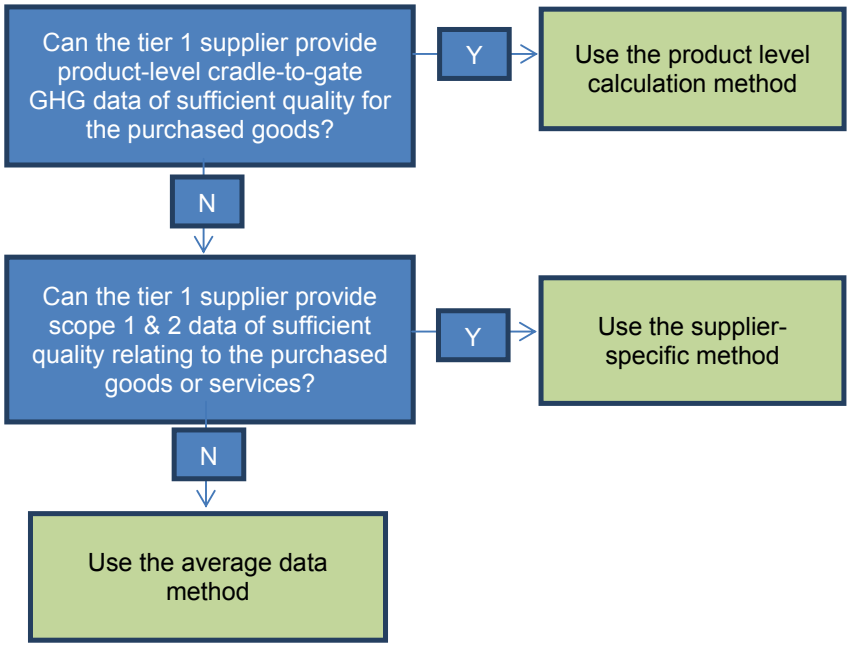
- Purchased Goods
- Purchased Services

Calculation Methods for Purchased Goods and Services

In general, to calculate the emissions associated with a particular purchased product, reporting companies should first determine whether the tier 1 supplier can provide product-level cradle-to-gate GHG data for the purchased product following the GHG Protocol *Product Standard*. If yes, the company should use the product-level method. If not, the company should determine whether the tier 1 supplier can provide scope 1 and 2 emissions data of sufficient quality relating to the purchased good or service. If yes, companies should use the supplier-specific method. If not, companies should use the average data method (i.e., calculate emissions by determining the amount or value of purchased goods and apply secondary emission factors).

[1] For more information on land use and land-use change, refer to Appendix C of the *GHG Protocol Product Standard*.

Figure 1. Decision Tree for selecting a Calculation Method



Option 1: Product-Level Method

Activity Data Needed

- Quantities or units of goods or services purchased

Emission Factors Needed

- Supplier-specific emission factors for the purchased goods or services (e.g. if the supplier has conducted a reliable cradle-to-gate GHG inventory, product footprint or internal LCA report)

Calculation Formula - Purchased Goods & Services, Product-Level Method

CO2e emissions for purchased goods or services=
Sum across purchased goods or services $\sum Quantities\ of\ good\ purchased\ (e.g.\ kg) \times$ $supplier\ specific\ emission\ factor\ of\ purchased\ good\ or\ service (e.g. kg\ CO2e/kg)$

Example

Company A is a construction company which purchases materials for its operations. Using its internal IT system Company A is able to determine the total weight (kg) purchased for each material.

Company A collects a supplier-specific emission factors for the purchased goods, which were produced as part of the suppliers' internal GHG inventory reports:

Purchased Service	Supplier	Quantities Purchased (kg)	Supplier-Specific Emission Factor (kg CO2e/kg)
Cement	Supplier C	200,000	0.15
Plaster	Supplier D	600,000	0.10
Paint	Supplier E	200,000	0.10
Timber	Supplier F	100,000	0.25
Concrete	Supplier G	50,000	0.20

Note: The activity data and emissions factors are illustrative only, and do not refer to actual data.

Total emissions of purchased goods by Company A is calculated as follows:

$\sum Quantities\ of\ good\ purchased\ (e.g.\ kg) \times$
$supplier\ specific\ emission\ factor\ of\ purchased\ good\ or\ service (e.g. kg\ CO2e/kg)$

=(200,000×0.15)+(600,000×0.1)+(200,000×0.1)+(100,000×0.25)+(50,000×0.2)
$= 145{,}000\ kg\ CO2(e)$

Option 2: Supplier-Specific Calculation Method

For Purchased Goods

Activity Data Needed

If the tier 1 supplier does not have a product level GHG inventory for the purchased goods, the reporting company should collect the following data from the tier 1 supplier:

- Allocated scope 1 and 2 data (including electricity, fuels, process and fugitives) by tier 1 supplier relating to purchased goods
- Mass of material inputs (e.g. bill of materials) used by tier 1 supplier to produce purchased goods
- Distance of transport of material inputs to tier 1 supplier (the transport emissions from the tier 1 supplier to the reporting company is calculated in category 4)Quantities of waste output by tier 1 supplier to produce purchased goods
- Other emissions emitted in provision of the purchased goods as applicable

Emission Factors Needed

The reporting company should collect:

- Emission factors for materials used by tier 1 supplier to produce purchased goods
- Emission factors for incoming transport of input materials to tier 1 supplier
- Emission factors for waste outputs by tier 1 supplier to produce purchased goods
- Other emission factors as applicable (e.g. process emissions)

Data Collection Guidance

The reporting company may request the following information from tier 1 suppliers to assist calculation:

- Internal data systems (e.g. bill of materials, freight distance of incoming raw materials) of tier 1 suppliers
- GHG inventory reports of tier 1 suppliers

Data sources for emission factors include:

- The GHG Protocol website (www.ghgprotocol.org)
- Company- or supplier-developed emission factors
- Industry associations
- Companies or suppliers, e.g. if the supplier has conducted a reliable cradle-to-gate inventory, product footprint or internal LCA report

In some life cycle databases, the cradle-to-gate emission factor of material inputs includes the transport, energy and waste emissions associated with the input material. In such cases, those associated emissions do not need to be calculated separately.

Calculation Formula- Purchased Goods & Services, Supplier-Specific Calculation Method

CO_2e emissions for purchased goods=

Sum across purchased goods

$\sum Scope\ 1\ and\ 2\ emissions\ of\ tier\ 1\ supplier\ relating\ to\ puchased\ good\ (kg\ CO2e)$

+

Sum across material inputs of the purchased goods:

$\sum Mass\ or\ value\ of\ material\ inputs\ used\ by\ Tier\ 1\ supplier\ relating\ to\ purchased\ good\ (kg\ or\ \$)$
$\times\ emission\ factor\ for\ the\ material\ (kg\ CO2e/kg\ or\ kg\ CO2e/\$)$

+

Sum across transport of material inputs to tier 1 supplier:

$\sum Distance\ of\ transport\ of\ material\ inputs\ to\ Tier\ 1\ supplier\ (km)$
$\times\ mass\ of\ material\ input\ (tonnes)$
$\times\ emission\ factor\ for\ the\ vehicle\ type\ ((kg\ CO2e/tonne)/km)$

+

Sum across waste outputs by tier 1 supplier relating to purchased goods:
$\sum Mass\ of\ waste\ from\ Tier\ 1\ supplier\ relating\ to\ the\ purchased\ good\ (kg)$
$\times\ emission\ factor\ for\ waste\ activity\ (kg\ CO2e/kg)$
+
Other emissions emitted in provision of the goods as applicable

Example

Company A is a company that designs and prints t-shirts, and purchases t-shirts from supplier B. Company A obtains the following information from supplier B regarding the material inputs, as well as scope 1 and 2 and waste outputs in supplier B's operations as it relates to those t-shirts. Company A collects representative emission factors by reference to life cycle databases.

Scope 1 and 2 data from supplier B relating to production of purchased goods

	Amount (kWh)	Emission Factor (kg CO2e/kWh)
Electricity	5,000	0.5
Natural gas	2,500	0.2

Material inputs of purchased goods

	Mass purchased (kg)	Emission Factor (kg CO2e/kg)
Cotton	5,000	7
Polymer	2,500	5
Chemical A	500	2
Chemical B	500	1.5

Transport of material inputs to supplier B

	Distance of Transport (km)	Vehicle Type Emission Factor (kg CO2e/kg)
Cotton	1,000	0.01
Polymer	2,500	0.02
Chemical A	800	0.05
Chemical B	200	0.1

Waste outputs by supplier B relating to production of purchased goods

	Amount (kg)	Emission Factor (kg CO2e/kg waste)
Waste t-shirts	100	0.5

Note: The activity data and emissions factors are illustrative only, and do not refer to actual data.

Emissions at each stage are calculated by multiplying activity data by respective emission factors, as follows:

Scope 1 and 2 emissions by Supplier B:
$\sum Scope\ 1\ and\ 2\ emissions\ of\ tier\ 1\ supplier\ relating\ to\ puchased\ good\ (kg\ CO2e)$
$= (5{,}000 \times 0.5) + (2{,}500 \times 0.2)$
$= 3{,}000\ kg\ CO2(e)$

Material input emissions:
$\sum Mass\ or\ value\ of\ material\ inputs\ used\ by\ Tier\ 1\ supplier\ relating\ to\ purchased\ good\ (kg\ or\ \$) \times$
$emission\ factor\ for\ the\ material\ (kg\ CO2e/kg\ or\ kg\ CO2e/\$)$
$= (5{,}000 \times 7) + (2{,}500 \times 5) + (500 \times 2) + (500 \times 1.5)$
$= 49{,}250\ kg\ CO2(e)$

Transport of material inputs emissions:

$\sum Distance\ of\ transport\ of\ material\ inputs\ to\ Tier\ 1\ supplier\ (km) \times$
$mass\ of\ material\ input\ (tonnes) \times emission\ factor\ for\ the\ vehicle\ type\ ((kg\ CO2e/tonne)/km)$
$= (5{,}000 \times 1{,}000 \times 0.01) + (2{,}500 \times 2{,}500 \times 0.02) + (500 \times 800 \times 0.05) + (500 \times 200 \times 0.1)$
$= 20{,}500\ kg\ CO2(e)$

Waste output by Supplier B:
$\sum Mass\ of\ waste\ from\ Tier\ 1\ supplier\ relating\ to\ the\ purchased\ good\ (kg) \times$
$emission\ factor\ for\ waste\ activity\ (kg\ CO2e/kg)$
$= 100\ \times 0.5$
$= 50\ kg\ CO2(e)$

Total emissions of purchased t-shirts from Supplier B is calculated by summing the above results, as follows:

$= 3{,}000 + 49{,}250 + 20{,}500 + 50$
$= 72{,}800\ kg\ CO2(e)$

For Purchased Services

Activity Data Needed
Companies should collect data from suppliers on the following, in the provision of the service:

- Scope 1 and 2 emissions of the tier 1 supplier relating to the purchased service
- Mass or value of goods used by tier 1 supplier in delivering the purchased service
- Quantities of waste produced by tier 1 supplier in delivering the purchased service

Emission Factors Needed
Companies should collect:

- Emission factors for goods per unit of mass or value
- Emission factors for waste outputs by tier 1 supplier to produce purchased services

Data Collection Guidance
Data sources for activity data include:

- Purchasing Records
- Service suppliers
- Internal IT systems

The scope 1 and 2 emissions of a supplier may be allocated by reference to total energy consumed for a given year, total number of man-hours worked, and/or the number of man-hours it took to complete the service.

Data sources for emission factors include:

- Life cycle databases
- Company or supplier developed emission factors
- Industry associations

Calculation Formula - Purchased Goods & Services, Purchased Services

CO2e emissions for purchased services =

Sum across purchased services
$\sum Scope\ 1\ and\ 2\ emissions\ of\ supplier\ relating\ to\ purchased\ service\ (kg\ CO2e)$

+

Sum across input goods used in provision of the purchased services to the reporting company:
$\sum Mass\ or\ value\ of\ input\ good\ (kg\ or\ \$)$
$\times\ emission\ factor\ for\ input\ good\ (kg\ CO2e/kg\ or\ kg\ CO2e/\$)$

+

Sum across waste outputs by tier 1 supplier relating to purchased services:
$\sum Mass\ of\ waste\ from\ Tier\ 1\ supplier\ relating\ to\ the\ purchased\ service\ (kg)$
$\times\ emission\ factor\ for\ waste\ activity (kg\ CO2e/kg)$

+

Other emissions emitted in provision of the services as applicable

Example

Company B purchased banking services from Supplier C. It is determined that in order to carry out the services, the following goods and energy sources are needed:

- Printed pages
- Envelopes
- Bank cards
- Waste produced in delivering services
- Electricity consumed in services including energy from servers, electricity consumed at the bank as well as diesel consumed by trucks to deliver letters to clients. These are the scope 2 emissions of Supplier C relating the purchased services.

Company B works with Supplier C to determine the amount of printed pages, envelopes and bank cards incurred by the services, as well as the electricity and fuel consumed. For each good and energy source, Company B collects representative emission factors from process life-cycle databases. The results are shown in the table below:

Group	Sub-group	Amount Consumed in Delivery of Service	Unit	Emission Factor per unit
Goods	Printed pages	10	kg	1.5
Goods	Envelopes	0.5	kg	1
Goods	Bank cards	1	kg	3
Waste	Waste paper	2	kg	0.5
Energy	Electricity consumed by servers	30	kWh	0.5
Energy	Electricity consumed by bankers	30	kWh	0.5
Energy	Diesel consumed by delivery trucks	10	Liters	3

Note: The activity data and emissions factors are illustrative only, and do not refer to actual data.

Total emissions of purchased services by Company B is calculated as follows:

Scope 1 and 2 emissions of Supplier C relating to service:

$$\sum Scope\ 1\ and\ 2\ emissions\ of\ supplier\ relating\ to\ purchased\ service\ (kg\ CO2e)$$
$$= (30 \times 0.5) + (30 \times 0.5) + (10 \times 3)$$
$$= 60\ kg\ CO2e$$

Emissions of goods relating to services:

$$\sum Mass\ or\ value\ of\ input\ good\ (kg\ or\ \$) \times$$
$$emission\ factor\ for\ input\ good\ (kg\ CO2e/kg\ or\ kg\ CO2e/\$)$$
$$= (10 \times 1.5) + (0.5 \times 1) + (1 \times 3)$$
$$= 18.5\ kg\ CO2e$$

Emissions of waste relating to services:

$$\sum Mass\ of\ waste\ from\ Tier\ 1\ supplier\ relating\ to\ the\ purchased\ service\ (kg) \times$$
$$emission\ factor\ for\ waste\ activity(kg\ CO2e/kg)$$
$$= 2 \times 0.5$$
$$= 1\ kg\ CO2e$$

Total scope 3 emissions:
$$= 60 + 18.5 + 1$$
$$= 79.5\ kg\ CO2(e)$$

Option 3: Material or Spend-Based Calculation Method

In this method, the company collects data on the mass, value or other relevant units of purchased goods or services and multiplies that by relevant secondary (e.g., industry average) emission factors. Secondary emission factors may be found in process-based life cycle inventory databases and/or environmentally extended input-output (EEIO) databases,

The company should decide whether to use process-based or EEIO data based on data quality considerations (see 6.2 of the *Scope 3 Standard*). Companies may use a combination of process-based and EEIO data.

Box X: Environmentally-Extended Input Output Data

Environmentally Extended Input-Output (EEIO) models estimate energy use and/or GHG emissions resulting from the production and upstream supply chain activities of different sectors and products within an economy. The resulting EEIO emissions factors can be used to estimate GHG emissions for a given industry or product category. EEIO data are particularly useful in screening emission sources when prioritizing data collection efforts.
EEIO models are derived by allocating national GHG emissions to groups of finished products based on economic flows between industry sectors. EEIO models vary in the number of sectors and products included and how often they are updated. EEIO data are often comprehensive, but the level of granularity is relatively low compared to other sources of data.

Activity Data Needed

If process-based data is used:

- Mass or number of units of purchased goods or services for a given year (e.g. kg, hours spent, etc)

If EEIO data is used:

- Amount spent on purchased goods or services, by product type, using market values (e.g. dollars)

Companies may organize the above data more efficiently by differentiating purchased goods or services into mass and spend categories, where appropriate

Emission Factors Needed

If process-based data is used:

- Cradle-to-gate emission factors of the purchased goods or services per unit of mass or unit of product (e.g. kg CO2e/kg or kg CO2e/hour spent)

If EEIO data is used:

- Cradle-to-gate emission factors of the purchased goods or services per unit of economic value (e.g. kg CO2e/$)

Data Collection Guidance

Data sources for activity data include:

- Internal data systems (e.g. bill of materials)
- Purchasing records

If a company does not know either the mass and type of products purchased or the amount spent on products purchased, the following estimates can be used, which are expected to increase the level of uncertainty of the calculated emissions:

- Industry-average activity data from associations or databases; and/or
- Proxy or extrapolated data from other purchased products in a company's scope 3 Inventory

Data sources for emission factors include:

- Process life cycle databases
- Environmentally extended input-output (EEIO) databases
- Industry associations

1 **Calculation Formula -** Purchased Goods & Services, Material or Spend-Based Calculation Method

CO2e emissions for purchased goods or services =

Sum across purchased goods or services
$\sum Mass\ of\ purchased\ good\ or\ service\ (kg) \times$
$emission\ factor\ of\ purchased\ good\ or\ service\ per\ unit\ of\ mass\ (kg\ CO2e/kg)$

OR

$\sum Unit\ of\ purchased\ good\ or\ service\ (e.g.piece)\ \times$
$emission\ factor\ of\ purchased\ good\ or\ service\ per\ reference\ unit(e.g.kg\ CO2e/piece)$

OR

$\sum Value\ of\ purchased\ good\ or\ service\ (\$)\ \times$
$emission\ factor\ of\ purchased\ good\ or\ service\ per\ unit\ of\ economic\ value\ (kg\ CO2e/\$)$

2

3 **Example**

Company E purchases over 1,000 components and raw materials to manufacture of a broad range of electronic goods. Instead of obtaining data from all suppliers and allocating emissions between 1,000 separate goods, the company groups purchased goods based on:

- Semi-processed components – e.g. average semiconductor
- Raw materials – e.g. average steel

For each component/raw material, Company E calculates the mass or value purchased by combining real data available through its IT systems with estimations and extrapolations. Company E decides to use process lifecycle databases for semi-processed components, and EEIO lifecycle databases for raw materials.

This is summarised in the following table:

Purchased Semi-processed Components	Mass Purchased (kg)	Emission Factor (kg CO2e/kg)
Hard drive	400	20
Integrated circuits	200	10
Liquid Crystal Display (LCD)	500	40
Semiconductors	100	70
Battery	1,500	3
Keyboard	300	3
Purchased Raw Materials	**Value ($)**	**Emission Factor (kg CO2e/$)**
Plastic (PS)	5,000	0.3
Plastic (ABS)	3,000	0.3
PET (film)	4,000	0.3
Aluminium	6,000	0.5
Steel	1,500	0.2
Cyclohexane	5,000	0.2
Epoxy resin	5,000	0.3
Copper	1,000	0.3
Glass	5,000	0.4

Note: the activity data and emissions factors are illustrative only, and do not refer to actual data.

Total emissions of purchased goods by Company E can be calculated by multiplying the mass/value purchased by the respective emission factors and summing the results, as follows:

$= (400 \times 20) + (200 \times 10) + (500 \times 40) + (100 \times 70) + (1{,}500 \times 3) + (300 \times 3) + (5{,}000 \times 0.3) + (3{,}000 \times 0.3) + (4{,}000 \times 0.3) + (6{,}000 \times 0.5) + (1{,}500 \times 0.2) + (5{,}000 \times 0.2) + (5{,}000 \times 0.3) + (1{,}000 \times 0.3) + (5{,}000 \times 0.4)$

$= 54{,}100\ kg\ CO2e$

1 Summary of Calculation Methods for Category 1 (Purchased goods and services)

Method	Calculation Formula	Activity Data Needed	Emission Factor Needed
1.Product-Level Method	Sum across purchased goods or services $\sum Quantities\ of\ good\ purchased\ (e.g.\ kg)$ $\times\ supplier\ specific\ emission\ factor\ of\ purchased\ good\ or\ service (e.g. kg\ CO2e/kg)$	• Quantities or units of goods or services purchased	• Supplier-specific emission factors for the purchased goods or services (e.g. if the supplier has conducted a reliable cradle-to-gate GHG inventory, product footprint or internal LCA report)
2.Supplier-Specific Method	Sum across purchased goods $\sum Scope\ 1\ and\ 2\ emissions\ of\ tier\ 1\ supplier\ relating\ to\ puchased\ good\ (kg\ CO2e)$ + Sum across material inputs of the purchased goods: $\sum Mass\ or\ value\ of\ material\ inputs\ used\ by\ Tier\ 1\ supplier\ relating\ to\ purchased\ good\ (kg\ or\ \$)$ $\times\ emission\ factor\ for\ the\ material\ (kg\ CO2e/kg\ or\ kg\ CO2e/\$)$ + Sum across transport of material inputs to tier 1 supplier: $\sum Distance\ of\ transport\ of\ material\ inputs\ to\ Tier\ 1\ supplier\ (km)$ $\times\ mass\ of\ material\ input\ (tonnes)$ $\times\ emission\ factor\ for\ the\ vehicle\ type\ ((kg\ CO2e/tonne)/km)$ + Sum across waste outputs by tier 1 supplier relating to purchased goods: $\sum Mass\ of\ waste\ from\ Tier\ 1\ supplier\ relating\ to\ the\ purchased\ good\ (kg)$ $\times\ emission\ factor\ for\ waste\ activity\ (kg\ CO2e/kg)$ + Other emissions emitted in provision of the goods as applicable	• Allocated scope 1 and 2 data (including electricity, fuels, process and fugitives) by tier 1 supplier relating to purchased goods • Mass of material inputs (e.g. bill of materials) used by tier 1 supplier to produce purchased goods • Distance of transport of material inputs to tier 1 supplier (the transport emissions from the tier 1 supplier to the reporting company is calculated in	• Emission factors for materials used by tier 1 supplier to produce purchased goods • Emission factors for incoming transport of input materials to tier 1 supplier • Emission factors for waste outputs by tier 1 supplier to produce purchased goods • Other emission factors as applicable (e.g. process emissions)

		category 4)Quantities of waste output by tier 1 supplier to produce purchased goods • Other emissions emitted in provision of the purchased goods as applicable	
3.Material- or Spend-Based Approach	Sum across purchased goods or services $\sum Mass\ of\ purchased\ good\ or\ service\ (kg)$ $\times\ emission\ factor\ of\ purchased\ good\ or\ service\ per\ unit\ of\ mass\ (kg\ CO2e/kg)$ OR $\sum Unit\ of\ purchased\ good\ or\ service\ (e.g. piece)$ $\times\ emission\ factor\ of\ purchased\ good\ or\ service\ per\ reference\ unit (e.g. kg\ CO2e/piece)$ OR $\sum Value\ of\ purchased\ good\ or\ service\ (\$)$ $\times\ emission\ factor\ of\ purchased\ good\ or\ service\ per\ unit\ of\ economic\ value\ (kg\ CO2e/\$)$	If process-based data is used: • Mass or number of units of purchased goods or services for a given year (e.g. kg, hours spent, etc.) If EEIO data is used: • Amount spent on purchased goods or services, by product type, using market values (e.g. dollars)	If process-based data is used: • Cradle-to-gate emission factors of the purchased goods or services per unit of mass or unit of product (e.g. kg CO2e/kg or kg CO2e/hour spent) If EEIO data is used: • Cradle-to-gate emission factors of the purchased goods or services per unit of economic value (e.g. kg CO2e/$)

Category 2: Capital Goods

This category includes all upstream (i.e., cradle-to-gate) emissions from the production of capital goods purchased or acquired by the reporting company in the reporting year. Emissions from the use of capital goods by the reporting company are accounted for in either scope 1 (e.g., for fuel use) or scope 2 (e.g., for electricity use), rather than scope 3.

Capital goods are final products that have an extended life and are used by the company to manufacture a product, provide a service, or sell, store, and deliver merchandise. In financial accounting, capital goods are treated as fixed assets or as plant, property, and equipment (PP&E). Examples of capital goods include equipment, machinery, buildings, facilities, and vehicles.

In certain cases, there may be ambiguity over whether a particular purchased product is a capital good (to be reported in category 2) or a purchased good (to be reported in category 1). Companies should follow their own financial accounting procedures to determine whether to account for a purchased product as a capital good in this category or as a purchased good or service in category 1. Companies should not double count emissions between category 1 and category 2.

Box 5.6 (from the *Scope 3 Standard):* Accounting for emissions from capital goods

In financial accounting, capital goods (sometimes called "capital assets") are typically depreciated or amortized over the life of the asset. For purposes of accounting for scope 3 emissions companies should not depreciate, discount, or amortize the emissions from the production of capital goods over time. Instead companies should account for the total cradle-to-gate emissions of purchased capital goods in the year of acquisition, the same way the company accounts for emissions from other purchased products in category 1. If major capital purchases occur only once every few years, scope 3 emissions from capital goods may fluctuate significantly from year to year. Companies should provide appropriate context in the public report (e.g., by highlighting exceptional or non-recurring capital investments).

Calculating Emissions from Capital Goods

Companies may use either of three methods to calculate scope 3 emissions from capital goods:

- **Product-Level Method –** involves collecting product level GHG inventory from the capital goods supplier
- **Supplier-specific Method**: involves determining the amount of materials, fuel, electricity, transport and waste incurred from the provision of capital goods and applying the appropriate emissions factors.
- **Material and/or Spend-Based Calculation Method**: involves estimating emissions for capital goods based on average data, such as average emissions per unit of capital good.

Companies should choose methods based upon business goals and data availability.

Option 1: Product Level Method

Activity Data Needed

- Quantities or units of capital goods purchased

Emission Factors Needed

- Supplier-specific emission factors for the purchased capital goods (e.g. if the supplier has conducted a reliable cradle-to-gate GHG inventory, product footprint or internal LCA report)

Calculation Formula – Capital Goods, Product-Level Method

CO2e emissions for purchased goods or services=
Sum across purchased goods or services $\sum Quantities\ of\ good\ purchased\ (e.g.\ unit)$ $\times\ supplier\ specific\ emission\ factor\ of\ capital\ good (kg\ CO2e/unit)$

Option 2: Supplier-Specific Method

Activity Data Needed

If the tier 1 supplier does not have a product level GHG inventory for the purchased capital goods, the reporting company should collect the following data from the tier 1 supplier:

- Allocated scope 1 and 2 data (including electricity, fuels, process and fugitives) by tier 1 supplier relating to purchased capital goods
- Mass of material inputs (e.g. bill of materials) used by tier 1 supplier to produce purchased capital goods
- Distance of transport of material inputs to tier 1 supplier (the transport emissions from the tier 1 supplier to the reporting company is calculated in category 4)
- Quantities of waste output by tier 1 supplier to produce purchased capital goods
- Other emissions emitted in provision of the purchased capital goods as applicable

Emission Factors Needed

The reporting company should collect:

- Emission factors for materials used by tier 1 supplier to produce purchased capital goods
- Emission factors for incoming transport of input materials to tier 1 supplier
- Emission factors for waste outputs by tier 1 supplier to produce purchased capital goods
- Other emission factors as applicable (e.g. process emissions)

Data Collection Guidance

The reporting company may request the following information from tier 1 suppliers to assist calculation:

- Internal data systems (e.g. bill of materials, freight distance of incoming raw materials) of tier 1 suppliers
- Environmental reports (e.g. Carbon Disclosure Project) of tier 1 suppliers

Data sources for emission factors include:

- The GHG Protocol website (www.ghgprotocol.org)
- Company- or supplier-developed emission factors
- Industry associations
- Companies or suppliers e.g. if the supplier has conducted a reliable cradle-to-gate inventory, product footprint or internal LCA report

Calculation Formula - Capital Goods, Supplier-specific Method

CO2e emissions for purchased capital goods=

Sum across purchased capital goods

$$\sum Scope\ 1\ and\ 2\ emissions\ of\ tier\ 1\ supplier\ relating\ to\ puchased\ capital\ good\ (kg\ CO2e)$$

+

Sum across material inputs of the purchased capital goods:

$$\sum Mass\ or\ value\ of\ material\ inputs\ used\ by\ Tier\ 1\ supplier\ relating\ to\ purchased\ capital\ good\ (kg\ or\ \$) \times emission\ factor\ for\ the\ material (kg\ CO2e/kg\ or\ kg\ CO2e/\$)$$

+

Sum across transport of material inputs to tier 1 supplier:

$$\sum Distance\ of\ transport\ of\ material\ inputs\ to\ Tier\ 1\ supplier\ (km) \times mass\ of\ material\ input (tonnes) \times emission\ factor\ for\ the\ vehicle\ type (kg\ CO2e/tonne)/km)$$

+

Sum across waste outputs by tier 1 supplier relating to purchased capital goods:

$$\sum Mass\ of\ waste\ from\ Tier\ 1\ supplier\ relating\ to\ the\ purchased\ capital\ good\ (kg) \times emission\ factor\ for\ waste\ activity\ (kg\ CO2e/kg)$$

+

Other emissions emitted in provision of the capital goods as applicable

Example

Company A is an independent power producer using wind turbines as capital goods to produce electricity. Company A purchases wind turbines from Supplier B. Company A collects data from Supplier B on the material inputs, fuel, electricity and waste outputs in supplier B's operations as it

relates to the purchased wind turbines. Company A collects representative emission factors by reference to life cycle databases.

Note: The emission factors for material inputs include emissions of transport to the supplier, energy consumed and waste outputs of the materials.

Scope 1 and 2 data from Supplier B relating to wind turbines

Fuels and Electricity	Amount (kWh)	Emission Factor (kg CO2e/kWh)
Natural Gas	100,000	0.2
Electricity	200,000	0.5

Materials inputs of wind turbines

Material Inputs	Mass (kg)	Emission Factor (kg CO2e/kg)
Steel	30,000	5
Iron	20,000	7
Rubber	10,000	2
Plastics	500	3

Transport of material inputs to supplier B

	Distance of Transport (km)	Vehicle Type Emission Factor (kg CO2e/kg)
Steel	200	0.01
Iron	100	0.02
Rubber	500	0.05
Plastics	400	0.1

Waste outputs by supplier B relating to production of purchased goods

	Amount (kg)	Emission Factor (kg CO2e/kg waste)
Waste outputs	2,000	0.5

Note: The activity data and emissions factors are illustrative only, and do not refer to actual data.

Emissions at each stage are calculated by multiplying activity data by respective emission factors, as follows:

$$\sum Scope\ 1\ and\ 2\ emissions\ of\ tier\ 1\ supplier\ relating\ to\ puchased\ capital\ good\ (kg\ CO2e)$$
$$= (100{,}000 \times 0.2) + (200{,}000 \times 0.5)$$
$$= 120{,}000\ kg\ CO2(e)$$

$$\sum Mass\ or\ value\ of\ material\ inputs\ used\ by\ Tier\ 1\ supplier\ relating\ to\ purchased\ capital\ good\ (kg\ or\ \$) \times emission\ factor\ for\ the\ material(kg\ CO2e/kg\ or\ kg\ CO2e/\$)$$
$$= (30{,}000 \times 5) + (20{,}000 \times 7) + (10{,}000 \times 2) + (500 \times 3)$$
$$= 311{,}500\ kg\ CO2(e)$$

$$\sum Distance\ of\ transport\ of\ material\ inputs\ to\ Tier\ 1\ supplier\ (km) \times mass\ of\ material\ input(tonnes) \times emission\ factor\ for\ the\ vehicle\ type(kg\ CO2e/tonne)/km)$$
$$= (30{,}000 \times 200 \times 0.01) + (20{,}000 \times 100 \times 0.02) + (10{,}000 \times 500 \times 0.05) + (500 \times 400 \times 0.1)$$
$$= 370{,}000\ kg\ CO2(e)$$

$$\sum Mass\ of\ waste\ from\ Tier\ 1\ supplier\ relating\ to\ the\ purchased\ capital\ good\ (kg) \times emission\ factor\ for\ waste\ activity\ (kg\ CO2e/kg)$$
$$= 2{,}000 \times 0.5$$
$$= 1{,}000\ kg\ CO2(e)$$

Total emissions of purchased t-shirts from Supplier B are calculated by summing the above results, as follows:

$$= 120{,}000 + 311{,}500 + 370{,}000 + 1{,}000$$
$$= 802{,}500\ kg\ CO2(e)$$

Option 3: Material or Spend-Based Calculation Method

In this method, the company collects data on the mass, value or other units of measure of the capital goods and multiplies that by relevant process based and/or environmentally extended input-output (EEIO) emission factors.

In such cases, companies should estimate emissions by approximating the main raw materials embodied in the capital good and multiply by the relevant emission factors.

The company should decide whether to use process based or EEIO data based on data quality considerations (see Chapter 7 of the *Scope 3 Standard*). A combination of process based and EEIO data is acceptable under the standard.

Activity Data Needed

If process-based data is used:

- Mass or number of units of purchased capital goods (e.g. kg, pieces, etc); or
- Mass of the main rain materials that make up the capital goods

If EEIO data is used:

- Amount spent on purchased capital goods, using market values (e.g. $)

Companies may organize the above data more efficiently by differentiating purchased capital goods into mass and spend categories, where appropriate

Emission Factors Needed

If process-based data is used:

- Cradle-to-gate emission factors of the purchased capital goods per unit of mass or unit of product (e.g. kg CO2e/kg or kg CO2e/piece); or
- Cradle-to-gate emission factors of the main raw materials embodied in the capital good

If EEIO data is used:

- Cradle-to-gate emission factors of the purchased capital goods per unit of economic value (e.g. kg CO2e/$)

Data Collection Guidance

Data sources for activity data include:

- Purchasing records
- Internal data systems

If a company does not know either the mass and type of capital goods purchased or the amount spent on capital goods, the following estimates can be used, which are expected to increase the level of uncertainty of the calculated emissions:

- Industry-average activity data from associations or databases; and/or
- Proxy or extrapolated data from other purchased products in a company's scope 3 Inventory

Data sources for emission factors include:

- Process life cycle databases
- Environmentally extended input-output (EEIO) databases
- Proxy data (e.g., companies who have conducted a reliable cradle-to-gate inventory or internal LCA report for a similar capital good)
- Industry associations

Calculation Formula – Capital Goods, Material and/or Spend-Based Calculation Method

CO2e emissions for purchased capital goods =
Sum across purchased capital goods $\sum Mass\ of\ purchased\ capital\ good\ (kg) \times$ $emission\ factor\ of\ purchased\ capital\ good\ per\ unit\ of\ mass (kg\ CO2e/kg)$

OR

$$\sum Unit\ of\ purchased\ capital\ good\ (e.g.piece)\ \times \\ emission\ factor\ of\ purchased\ capital\ good\ per\ reference\ unit(kg\ CO2e/piece)$$

OR

$$\sum Value\ of\ purchased\ capital\ good\ (\$)\ \times \\ emission\ factor\ of\ purchased\ capital\ good\ per\ unit\ of\ economic\ value(kg\ CO2e/\$)$$

Example

Company A is a textiles manufacturer who uses a number of capital goods for its operations. For each capital good, Company A collects information on quantity/value purchased and sources process or EEIO based data based on data availability and data quality considerations.

This is summarised in the following table:

Capital Good	Quantity Purchased (Units)	Emission Factor (kg CO2e/Unit)
Factory plant	2	50,000
Trucks	50	5,000
Capital Good	**Value ($)**	**Emission Factor (kg CO2e/$)**
Equipment	100,000	2
Machinery	2,000,000	0.1

Note: The activity data and emissions factors are illustrative only, and do not refer to actual data.

Emissions are calculated by multiplying activity data by respective emission factors, as follows:

Emissions of factory plant:

$$\sum Unit\ of\ purchased\ capital\ good\ (e.g.piece) \\ \times emission\ factor\ of\ purchased\ capital\ good\ per\ reference\ unit(kg\ CO2e/piece) \\ = 2 \times 50{,}000 \\ = 100{,}000\ kg\ CO2(e)$$

Emissions of trucks:

$$\sum Unit\ of\ purchased\ capital\ good\ (e.g.piece) \\ \times emission\ factor\ of\ purchased\ capital\ good\ per\ reference\ unit(kg\ CO2e/piece) \\ = 50 \times 5{,}000 \\ = 250{,}000\ kg\ CO2(e)$$

Emissions of equipment:

$$\sum Value\ of\ purchased\ capital\ good\ (\$)\ \times \\ emission\ factor\ of\ purchased\ capital\ good\ per\ unit\ of\ economic\ value(kg\ CO2e/\$) \\ = 100{,}000 \times 2 \\ = 200{,}000\ kg\ CO2(e)$$

Emissions of machinery

$$\sum Value\ of\ purchased\ capital\ good\ (\$)\ \times \\ emission\ factor\ of\ purchased\ capital\ good\ per\ unit\ of\ economic\ value(kg\ CO2e/\$) \\ = 2{,}000{,}000 \times 0.1 \\ = 200{,}000\ kg\ CO2(e)$$

Total emissions of purchased t-shirts from Supplier B is calculated by summing the above results, as follows:

$$= Emissions\ of\ factory\ plant\ +\ emissions\ of\ trucks\ +\ emissions\ of\ equipment \\ +\ emissions\ of\ machinery \\ = 100{,}000 + 250{,}000 + 200{,}000 + 200{,}000 \\ = 750{,}000\ kg\ CO2(e)$$

1 Summary of Calculation Methods for Category 2 (Capital goods)

Method	Calculation Formula	Activity Data Needed	Emission Factor Needed
1.Product-Level Method	Sum across purchased goods or services $\sum Quantities\ of\ good\ purchased\ (e.g.\ unit)$ $\times\ supplier\ specific\ emission\ factor\ of\ capital\ good (kg\ CO2e/unit)$	• Quantities or units of capital goods purchased	• Supplier-specific emission factors for the purchased capital goods (e.g. if the supplier has conducted a reliable cradle-to-gate GHG inventory, product footprint or internal LCA report)
2.Supplier-Specific Method	Sum across purchased capital goods $\sum Scope\ 1\ and\ 2\ emissions\ of\ tier\ 1\ supplier\ relating\ to\ puchased\ capital\ good\ (kg\ CO2e)$ + Sum across material inputs of the purchased capital goods: $\sum Mass\ or\ value\ of\ material\ inputs\ used\ by\ Tier\ 1\ supplier\ relating\ to\ purchased\ capital\ good$ $(kg\ or\ \$) \times emission\ factor\ for\ the\ material (kg\ CO2e/kg\ or\ kg\ CO2e/\$)$ + Sum across transport of material inputs to tier 1 supplier: $\sum Distance\ of\ transport\ of\ material\ inputs\ to\ Tier\ 1\ supplier\ (km)$ $\times\ mass\ of\ material\ input (tonnes)$ $\times\ emission\ factor\ for\ the\ vehicle\ type (kg\ CO2e/tonne)/km)$ + Sum across waste outputs by tier 1 supplier relating to purchased capital goods: $\sum Mass\ of\ waste\ from\ Tier\ 1\ supplier\ relating\ to\ the\ purchased\ capital\ good\ (kg)$ $\times\ emission\ factor\ for\ waste\ activity\ (kg\ CO2e/kg)$ + Other emissions emitted in provision of the capital goods as applicable	If the tier 1 supplier does not have a product level GHG inventory for the purchased capital goods, the reporting company should collect the following data from the tier 1 supplier: • Allocated scope 1 and 2 data (including electricity, fuels, process and fugitives) by tier 1 supplier relating to purchased capital goods • Mass of material inputs (e.g. bill of materials) used by tier 1 supplier to produce purchased capital goods	• The reporting company should collect: • Emission factors for materials used by tier 1 supplier to produce purchased capital goods • Emission factors for incoming transport of input materials to tier 1 supplier • Emission factors for waste outputs by tier 1 supplier to produce purchased capital goods • Other emission factors as applicable (e.g. process emissions)

		• Distance of transport of material inputs to tier 1 supplier • Quantities of waste output by tier 1 supplier to produce purchased capital goods • Other emissions emitted in provision of the purchased capital goods as applicable	
3.Material- or Spend-Based Approach	Sum across purchased capital goods $\sum Mass\ of\ purchased\ capital\ good\ (kg)$ $\times\ emission\ factor\ of\ purchased\ capital\ good\ per\ unit\ of\ mass(kg\ CO2e/kg)$ OR $\sum Unit\ of\ purchased\ capital\ good\ (e.g. piece)$ $\times\ emission\ factor\ of\ purchased\ capital\ good\ per\ reference\ unit(kg\ CO2e/piece)$ OR $\sum Value\ of\ purchased\ capital\ good\ (\$)$ $\times\ emission\ factor\ of\ purchased\ capital\ good\ per\ unit\ of\ economic\ value(kg\ CO2e/\$)$	If process-based data is used: • Mass or number of units of purchased capital goods (e.g. kg, pieces, etc); or • Mass of the main rain materials that make up the capital goods If EEIO data is used: • Amount spent on purchased capital goods, using market values (e.g. $)	If process-based data is used: • Cradle-to-gate emission factors of the purchased capital goods per unit of mass or unit of product (e.g. kg CO2e/kg or kg CO2e/piece); or • Cradle-to-gate emission factors of the main raw materials embodied in the capital good If EEIO data is used: • Cradle-to-gate emission factors of the purchased capital goods per unit of economic value (e.g. kg CO2e/$)

Category 3: Fuel- and Energy-Related Activities Not Included in Scope 1 and 2

This category includes emissions related to the production of fuels and energy purchased and consumed by the reporting company in the reporting year that are not included in scope 1 or scope 2.

Category 3 excludes emissions from the combustion of fuels or electricity consumed by the reporting company, since they are already included in scope 1 or scope 2. Scope 1 includes emissions from the combustion of fuels by sources owned or controlled by the reporting company. Scope 2 includes the emissions from the combustion of fuels to generate electricity, steam, heating, and cooling purchased and consumed by the reporting company.

This category includes emissions from four distinct activities (see table 5.5).

Table 5.5 (from the *Scope 3 Standard*): Activities included in category 3 (Fuel- and energy-related emissions not included in scope 1 or scope 2)

Activity	Description	Applicability
A. Upstream emissions of purchased fuels	Extraction, production, and transportation of fuels consumed by the reporting company • Examples include mining of coal, refining of gasoline, transmission and distribution of natural gas, production of biofuels, etc.	Applicable to end users of fuels
B. Upstream emissions of purchased electricity	Extraction, production, and transportation of fuels consumed in the generation of electricity, steam, heating, and cooling that is consumed by the reporting company • Examples include mining of coal, refining of fuels, extraction of natural gas, etc.	Applicable to end users of electricity, steam, heating and cooling
C. T&D losses	Generation of electricity, steam, heating, and cooling that is consumed (i.e., lost) in a transmission and distribution (T&D) system – reported by end user	
D. Generation of purchased electricity that is sold to end users	Generation of electricity, steam, heating, and cooling that is purchased by the reporting company and sold to end users – reported by utility company or energy retailer • Note: This activity is particularly relevant for utility companies that purchase wholesale electricity supplied by independent power producers for resale to their customers.	Applicable to utility companies and energy retailers

Box 5.7 (from the *Scope 3 Standard*): Accounting for emissions from the production, transmission, and use of electricity

Figure 5.4 illustrates an electricity value chain. A coal mining and processing company (A) directly emits 5 metric tons of CO_2e per year from its operations and sells coal to a power generator (B), which generates 100 MWh of electricity and directly emits 100 metric tons of CO_2e per year. A utility (C) that owns and operates a transmission and distribution (T&D) system purchases all of the generator's electricity. The utility consumes 10 MWh due to T&D losses (corresponding to 10 metric tons CO_2e of scope 2 emissions per year) and delivers the remaining 90 MWh to an end user (D), which consumes 90 MWh (corresponding to 90 metric tons CO_2e of scope 2 emissions per year).

Figure 5.4. Emissions across an electricity value chain

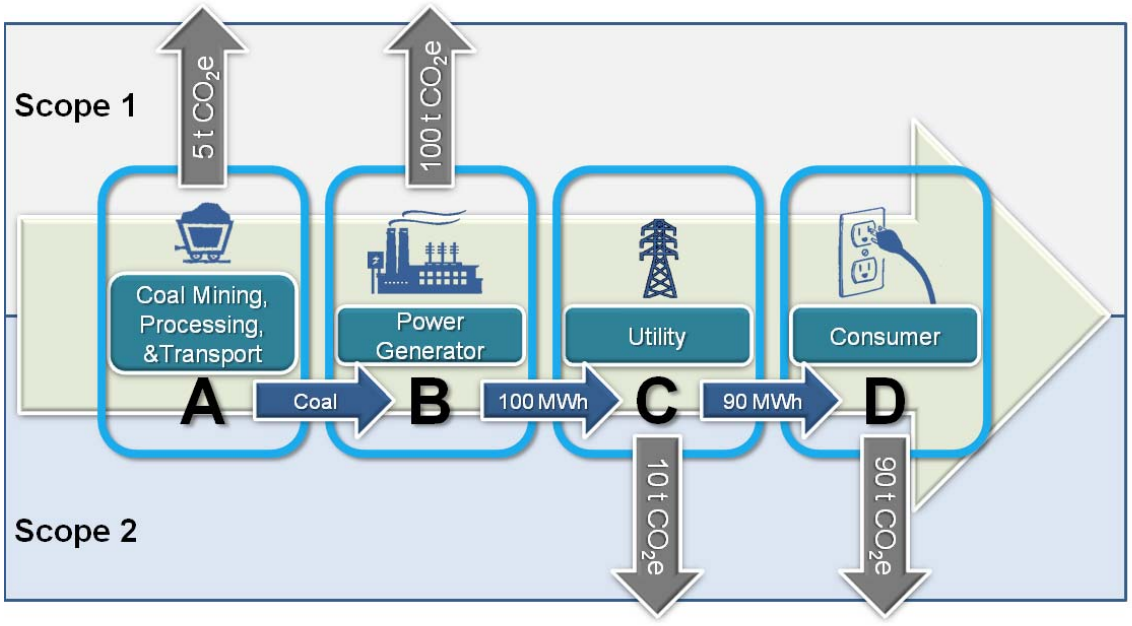


Table 5.6 explains how each company accounts for GHG emissions. In this example, the emission factor of the electricity sold by Company B is 1 t CO_2e/MWh. All numbers are illustrative only.

Table 5.6 (from the *Scope 3 Standard*): Accounting for emissions across an electricity value chain

Reporting Company	Scope 1	Scope 2	Scope 3
Coal mining, processing, and transport (Company A)	5 t CO_2e	0 (unless electricity is used during coal mining and processing)	100 t CO_2e from the combustion of sold products (i.e., coal) *Reported in category 11 (Use of sold products)*
Power generator (Company B)	100 t CO_2e	0	5 t CO_2e from the extraction, production, and transportation of fuel (i.e., coal) consumed by the reporting company *Reported in Category 3 (Fuel- and energy-related activities)* Note: The generator does not account for scope 3 emissions associated with sold electricity because the emissions are already accounted for in scope 1.
Utility (Company C)	0 (unless SF_6 is released from the T&D system)	10 t CO_2e from the generation of electricity purchased and consumed by Company C	0.5 t CO_2e from the extraction, production, and transportation of fuels (i.e., coal) consumed in the generation of electricity consumed by Company C (5 tons from coal mining x 10 percent of electricity generated by B that is consumed by C) 90 t CO_2e from the generation of electricity purchased by Company C and sold to Company D *Both are reported in category 3 (Fuel- and energy-related activities)*
End consumer of electricity (Company D)	0	90 t CO_2e from the generation of electricity purchased and consumed by Company D	5 t CO_2e from the extraction, production, and transportation of coal consumed in the generation of electricity consumed by Company D 10 t CO_2e from the generation of electricity that is consumed (i.e., lost) in transmission and distribution *Both are reported in category 3 (Fuel- and energy-related activities)*

Calculating Upstream Emissions of Purchased Fuels (Activity A of Table 4.5)

This activity includes the extraction, production, and transportation of fuels consumed by the reporting company.

Calculation Method: Supplier-Specific or Average-Data Method

Activity Data Needed
Companies should collect data on:

- Quantities and types of fuel consumed

Emission Factors Needed
Companies should select an emissions factor using one of the following approaches:

Supplier-specific approach

- Fuel-provider-specific emission factors on extraction, production and transportation of fuels per unit of fuel consumed by the reporting company (e.g. kg CO2e/kWh), by fuel type and country or region

If data for the above is not available or applicable, companies should use the following approach.

Average data approach

- Average emission factors for upstream emissions per unit of consumption (e.g. kg CO2e/kWh)

To calculate the scope 3 emissions from this category, companies should use emission factors that account for all the activities in Table 4.5. Emission factors can be obtained from many sources, some of which will be a full cradle-to-grave (well-to-wheel) emissions factor. Where this is the case the combustion emissions should be subtracted from the total emission factor, as they are included within a Scope 1 inventory and in a separate memo item (in the case of direct CO_2 emissions from combustion of biomass/biofuels).

Data Collection Guidance
Companies may obtain data by:

- Reference to their scope 1 GHG inventory, including sources and types of fuels consumed;
- Collecting data from their fuel procurement departments;
- If necessary, collecting data from fuel suppliers; and/or
- Reference to life cycle databases
- The GHG Protocol website www.ghgprotocol.org

Calculation Formula - Upstream Emissions of Purchased Fuels, Supplier-Specific or Average-Data Method
Some sources of emission factor will report the GHG emissions from upstream scope 3 emissions separately from the combustion emissions, however where this is not the case it is possible to determine the GHG emissions from scope 3 emissions by using the following formula.

Upstream Emissions of Purchased Fuels (Extraction, production, and transportation of fuels consumed by the reporting company) =
Sum Across Each Fuel Type Consumed: $\sum Fuel\ Consumed\ (kWh) \times Upstream\ Fuel\ Emission\ Factor\ (kg\ CO2e)/kWh)$ Where: $Upstream\ fuel\ emission\ factor = Cradle\ to\ gate\ emission\ factor - Combustion\ emissions\ factor$

Calculating Upstream Emissions of Purchased Electricity (Activity B of Table 4.5)

This activity includes the extraction, production, and transportation of fuels consumed in the generation of electricity, steam, heating and cooling that is consumed by the reporting company.

Calculation Method: Supplier-Specific or Average-Data Method

Companies should disaggregate the total amount of electricity, steam, heating, or cooling purchased, by characteristics such as supplier, grid region or country. Energy consumption data should then be multiplied by representative emission factors (e.g. supplier or regionally specific) to calculate emissions.

Activity Data Needed

Companies should collect data on:

- Total quantities of electricity, steam, heating or cooling purchased and consumed per unit of consumption (e.g. MWh), broken down by supplier, grid region or country

Emission Factors Needed

Companies should select an emissions factor using one of the following approaches:

Supplier-specific approach

- Utility-specific emission factors for extraction, production and transportation of fuels consumed per MWh of electricity, steam, heating or cooling generated

If data for the above is not available or applicable, the following approach should be used.

Average data approach

- Grid-region, country, or regional emission factors for extraction, production and transportation of fuels per unit of consumption (e.g. kg CO2e/kWh) of electricity, steam, heating or cooling generated

Companies should use "upstream" electricity emission factors that exclude emissions from combustion, since emissions from combustion are accounted for in the grid average emission factor used to calculate scope 2 emissions.

Data Collection Guidance

Data sources for activity data include:

- Reference to their scope 1 and 2 GHG inventories, including sources of electricity, heat, steam, and cooling consumption and the grid mix where the electricity was consumed;
- Collecting data from their energy management departments; and/or
- If necessary, collecting data from energy suppliers or generators

Data sources for emission factors include:

- Supplier developed emission factors; and/or
- Life cycle databases - excluding emissions from fuel combusted to generate electricity)

Calculation Formula - Upstream Emissions of Purchased Electricity, Supplier-Specific or Average-Data Method

Upstream Emissions of Purchased Electricity (Extraction, production, and transportation of fuels consumed in the generation of electricity, steam, heating and cooling that is consumed by the reporting company) =
Sum across suppliers, regions or countries $\sum(Electricity\ Consumed\ \ (kWh) \times\ Upstream\ Electricity\ Emission\ Factor\ \ (kgCO2e)/kWh)) +$ $(Steam\ Consumed\ \ (kWh) \times\ Upstream\ Steam\ Emission\ Factor\ \ (kg\ CO2e)/kWh)) +$ $(Heating\ Consumed\ \ (kWh) \times\ Upstream\ Heating\ Emission\ Factor(kg\ CO2e)/kWh)) +$ $(Cooling\ Consumed\ \ (kWh) \times\ Upstream\ Cooling\ Emission\ Factor\ \ (kg\ CO2e)/kWh))$ Where: $Upstream\ emission\ factor\ (fuel, electricity, steam, heating, cooling) =$ $Cradle\ to\ gate\ emission\ factor\ (fuel, electricity\ \ldots)$ $-\ Combustion\ emissions\ factor\ (fuel, electricity\ \ldots)$

Calculating Emissions from Transmission & Distribution (T&D) Losses (Activity C in Table 4.5)

This activity includes the lifecycle emissions of electricity, steam, heating, and cooling that is consumed (i.e., lost) in a transmission and distribution (T&D) system.

Calculation Method: Supplier-Specific or Average-Data Method

Activity Data Needed
Companies should collect data on:

- Electricity, steam, heating or cooling per unit of consumption (e.g. MWh), broken down by grid region or country; and/or
- Scope 2 emissions data

Emission Factors Needed
Companies should collect combustion emission factors for electricity, steam, heating and cooling, and also the following using the below approaches

Supplier-specific approach

- Utility-specific transmission & distribution loss rate (%), specific to grid where energy is generated and consumed

If data for the above is not available or applicable, the following approach should be used.

Average data approach

- Country average transmission & distribution loss rate (%)
- Regional average transmission & distribution loss rate (%)
- Global average transmission & distribution loss rate (%)

Calculation Formula - Transmission & Distribution (T&D) Losses, Supplier-Specific or Average-Data Method

Emissions of T&D Losses (Generation of electricity, steam, heating, and cooling that is consumed (i.e., lost) in a transmission and distribution (T&D) system) =

Sum Across suppliers, regions or countries

$$\sum(Electricity\ Consumed\ \ (kWh)\ \times\ Electricity\ Combustion\ Emission\ Factor\ \ ((kg\ CO2e)/kWh) \times T\&D\ Loss\ Rate\ (\%))$$
$$+(Steam\ Consumed\ \ (kWh)\ \times\ Steam\ Combustion\ Emission\ Factor\ \ ((kg\ CO2e)/kWh) \times T\&D\ Loss\ Rate\ (\%))$$
$$+(Heating\ Consumed\ \ (kWh)\ \times\ Heating\ Combustion\ Emission\ Factor\ \ ((kg\ CO2e)/kWh) \times T\&D\ Loss\ Rate\ (\%))$$
$$+(Cooling\ Consumed\ \ (kWh)\ \times\ Cooling\ Combustion\ Emission\ Factor\ \ ((kg\ CO2e)/kWh) \times T\&D\ Loss\ Rate\ (\%))$$

Where:

Electricity Combustion Emission Factor includes emissions from the combustion of fuels to generate electricity, but does not include emissions from the extraction, production, and transportation of fuels consumed during electricity generation.

OR

Sum Across suppliers, regions or countries

$$\sum(Scope\ 2\ Emissions\ from\ Electricity\ Use\ \ (kg\ CO_2e) \times T\&D\ Loss\ Rate\ (\%))$$
$$+\ (Scope\ 2\ Emissions\ from\ Steam\ Use\ \ (kg\ CO_2e) \times\ T\&D\ Loss\ Rate\ (\%))$$
$$+\ (Scope\ 2\ Emissions\ from\ Heating\ Use\ \ (kg\ CO_2e)\ \times\ T\&D\ Loss\ Rate\ (\%))$$
$$+\ (Scope\ 2\ Emissions\ from\ Cooling\ Use\ \ (kg\ CO_2e)\ \times T\&D\ Loss\ Rate\ (\%))$$

Where:

Scope 2 emissions are calculated using Combustion Emission Factors (see above)

Calculating Emissions from Power that is Purchased and Sold (Activity D in Table 4.5)

This activity includes the generation of electricity, steam, heating, and cooling that is purchased by the reporting company and sold to end users (reported by utility company or energy retailer).

Activity Data Needed

Companies should collect data on:

- Quantities and specific source (e.g., generation unit) of electricity purchased and re-sold

Emission Factors Needed

Companies should collect data using one of the following approaches:

Supplier-specific approach

- Specific emission rate for generation unit from which purchased power is generated

If data for the above is not available or applicable, the following approach should be used.

Average data approach

- Grid average or national emission rate for the origin of purchased power

Calculation Formula - Emissions from Power that is Purchased and Sold, Supplier-Specific or Average-Data Method

Emissions from power that is purchased and sold (Generation of electricity, steam, heating, and cooling that is purchased by the reporting company and sold to end users (reported by utility company or energy retailer)) =
Sum Across suppliers, regions or countries $\sum(Electricity\ purchased\ for\ resale\ \ (kWh)\ \times\ Electricity\ Combustion\ Emission\ Factor\ \ ((kg\ CO2\ e)/kWh))$ $+(Steam\ purchased\ for\ resale\ \ (kWh)\ \times\ Steam\ Combustion\ Emission\ Factor\ \ ((kg\ CO2\ e)/kWh))$ $+(Heating\ purchased\ for\ resale\ \ (kWh)\ \times\ Heating\ Combustion\ Emission\ Factor\ \ ((kg\ CO2\ e)/kWh))$ $+(Cooling\ purchased\ for\ resale\ \ (kWh)\ \times\ Cooling\ Combustion\ Emission\ Factor\ \ ((kg\ CO2\ e)/kWh)$

Example:

Company A specializes in data center services and operates in 10 countries. It purchases electricity to run data centers in each country, as well as district heating in some countries. It is able to collect primary data on all electricity purchased through an energy tracking system:

Note that this is an example for category 3 as a whole. As Company A is not a utility company then the emissions from power that is purchased and sold is not included.

Country	Electricity purchased (kWh)	District heating purchased (kWh)
Australia	500,000	N/A
Canada	600,000	50,000
India	400,000	N/A
United States	5,500,000	N/A
Turkey	200,000	N/A

Note: the activity data are illustrative only, and do not refer to actual data.

Company A sources emission factors for extraction, production and transportation related emissions of fuels for producing electricity/heating, as well as transmission and distribution losses:

Country	Upstream Emission Factor of Purchased Electricity (kg CO2e/kWh)	Electricity/Heat Combustion Emission Factor (kg CO2e/kWh)	Distribution and Transmission Loss rate (%)	Upstream Emission Factor of purchased heating (kg CO2e/kWh)
Australia	0.12	0.8 (electricity)	10% (electricity)	N/A
Canada	0.10	0.4 (electricity) 0.15 (heat)	13% (electricity) 5% (heat)	0.05
India	0.15	0.8 (electricity)	15% (electricity)	N/A
United States	0.10	0.5 (electricity)	10% (electricity)	N/A
Turkey	0.05	0.4 (electricity)	12% (electricity)	N/A

Note: the emissions factors are illustrative only, and do not refer to actual data.

Upstream emissions from purchased electricity (Activity B):

$= (500{,}000 \times 0.12) + (600{,}000 \times 0.1) + (400{,}000 \times 0.15) + (5{,}500{,}000 \times 0.1) + (200{,}000 \times 0.05)$
$= 740{,}000\ kg\ CO2e$

Upstream emissions from transmission and distribution losses (Activity C):

$= (500{,}000 \times 0.8 \times 0.1) + (600{,}000 \times 0.4 \times 0.13) + (50{,}000 \times 0.15 \times 0.05) + (400{,}000 \times 0.8 \times 0.15) + (5{,}500{,}000 \times 0.5 \times 0.1) + (200{,}000 \times 0.4 \times 0.12)$
$= 404{,}175\ kg\ CO2e$

Upstream emissions from purchased heating (Activity B):

$= 50{,}000 \times 0.05$
$= 2{,}500\ kg\ CO2e$

Total emissions from upstream purchased electricity and heat including transmission and distribution losses is calculated as follows:

$= 740{,}000\ +\ 404{,}175\ +\ 2{,}500$
$= 1{,}146{,}675\ kg\ CO2e$

1 **Summary of Calculation Methods for Category 3 (Fuel and energy-related activities not included in scope 1 or 2)**

Method	Calculation Formula	Activity Data Needed	Emission Factor Needed
A. Upstream emissions of purchased fuels			
Supplier-Specific or Average Data Method	Sum Across Each Fuel Type Consumed: $\sum Fuel\ Consumed\ (kWh)\ \times\ Upstream\ Fuel\ Emission\ Factor\ (kg\ CO2e)/kWh)$ Where: $Upstream\ fuel\ emission\ factor =$ $Cradle\ to\ gate\ emission\ factor -\ Combustion\ emissions\ factor$	Quantities and types of fuel consumed	*Supplier-specific approach* • Fuel-provider-specific emission factors on extraction, production and transportation of fuels per unit of fuel consumed by the reporting company (e.g. kg CO2e/kWh), by fuel type and country or region *Average data approach* • Average emission factors for upstream emissions per unit of consumption (e.g. kg CO2e/kWh)
B. Upstream emissions of purchased electricity			
Supplier-Specific or Average-Data Method	Sum across suppliers, regions or countries $\sum(Electricity\ Consumed\ \ (kWh)$ $\times\ Upstream\ Electricity\ Emission\ Factor\ \ (kgCO2e)/kWh))$ $+\ (Steam\ Consumed\ \ (kWh)$ $\times\ Upstream\ Steam\ Emission\ Factor\ \ (kg\ CO2e)/kWh))$ $+\ (Heating\ Consumed\ \ (kWh)$ $\times\ Upstream\ Heating\ Emission\ Factor(kg\ CO2e)/kWh))$ $+\ (Cooling\ Consumed\ \ (kWh)$ $\times\ Upstream\ Cooling\ Emission\ Factor\ \ (kg\ CO2e)/kWh))$ Where: $Upstream\ emission\ factor\ (fuel, electricity, steam, heating, cooling) =$ $Cradle\ to\ gate\ emission\ factor\ (fuel, electricity\ \ldots)$ $-\ Combustion\ emissions\ factor\ (fuel, electricity\ \ldots)$	Total quantities of electricity, steam, heating or cooling purchased and consumed per unit of consumption (e.g. MWh), broken down by supplier, grid region or country	*Supplier-specific approach* • Utility-specific emission factors for extraction, production and transportation of fuels consumed per MWh of electricity, steam, heating or cooling generated *Average data approach* • Grid-region, country, or regional emission factors for extraction, production and transportation of fuels per unit of consumption (e.g. kg CO2e/kWh) of electricity, steam, heating or cooling generated
C. T&D losses			

Supplier-Specific or Average-Data Method	Sum Across suppliers, regions or countries $\sum(Electricity\ Consumed\ \ (kWh)\ \times$ $Electricity\ Combustion\ Emission\ Factor\ \ ((kg\ CO2e)/kWh) \times\ T\&D\ Loss\ Rate\ (\%))$ $+(Steam\ Consumed\ \ (kWh)\ \times\ Steam\ Combustion\ Emission\ Factor\ \ ((kg\ CO2e)/kWh)$ $\times\ T\&D\ Loss\ Rate\ (\%))$ $+(Heating\ Consumed\ \ (kWh)$ $\times\ Heating\ Combustion\ Emission\ Factor\ \ ((kg\ CO2e)/kWh)$ $\times\ T\&D\ Loss\ Rate\ (\%))$ $+(Cooling\ Consumed\ \ (kWh)\ \times\ Cooling\ Combustion\ Emission\ Factor\ \ ((kg\ CO2e)/kWh)$ $\times\ T\&D\ Loss\ Rate\ (\%))$ Where: Electricity Combustion Emission Factor includes emissions from the combustion of fuels to generate electricity, but does not include emissions from the extraction, production, and transportation of fuels consumed during electricity generation. OR Sum Across suppliers, regions or countries $\sum(Scope\ 2\ Emissions\ from\ Electricity\ Use\ \ (kg\ CO_2e) \times T\&D\ Loss\ Rate\ (\%))$ $+\ (Scope\ 2\ Emissions\ from\ Steam\ Use\ \ (kg\ CO_2e) \times\ T\&D\ Loss\ Rate\ (\%))$ $+\ (Scope\ 2\ Emissions\ from\ Heating\ Use\ \ (kg\ CO_2e)\ \times\ T\&D\ Loss\ Rate\ (\%))$ $+\ (Scope\ 2\ Emissions\ from\ Cooling\ Use\ \ (kg\ CO_2e)\ \times T\&D\ Loss\ Rate\ (\%))$ Where: Scope 2 emissions are calculated using Combustion Emission Factors (see above)	• Electricity, steam, heating or cooling per unit of consumption (e.g. MWh), broken down by grid region or country; and/or • Scope 2 emissions data	*Supplier-specific approach* • Utility-specific transmission & distribution loss rate (%), specific to grid where energy is generated and consumed *Average data approach* • Country average transmission & distribution loss rate (%) • Regional average transmission & distribution loss rate (%) • Global average transmission & distribution loss rate (%)
D. Generation of purchased electricity that is sold to end users			
Supplier-Specific or Average-Data Method	Sum Across suppliers, regions or countries $\sum(Electricity\ purchased\ for\ resale\ \ (kWh)\ \times$ $Electricity\ Combustion\ Emission\ Factor\ \ ((kg\ CO2\ e)/kWh))$ $+(Steam\ purchased\ for\ resale\ \ (kWh)$ $\times\ Steam\ Combustion\ Emission\ Factor\ \ ((kg\ CO2\ e)/kWh))$ $+(Heating\ purchased\ for\ resale\ \ (kWh)$ $\times\ Heating\ Combustion\ Emission\ Factor\ \ ((kg\ CO2\ e)/kWh))$ $+(Cooling\ purchased\ for\ resale\ \ (kWh)$ $\times\ Cooling\ Combustion\ Emission\ Factor\ \ ((kg\ CO2\ e)/kWh)$	Quantities and specific source (e.g., generation unit) of electricity purchased and re-sold	*Supplier-specific approach* • Specific emission rate for generation unit from which purchased power is generated *Average data approach* • Grid average or national emission rate for the origin of purchased power

Category 4: Upstream Transportation and Distribution

Category Description

This category includes emissions from the transportation and distribution of products (excluding fuel and energy products) purchased or acquired by the reporting company in the reporting year in vehicles and facilities not owned or operated by the reporting company, as well as other transportation and distribution services purchased by the reporting company in the reporting year (including both inbound and outbound logistics).

Specifically, this category includes:

- Transportation and distribution of products purchased by the reporting company in the reporting year, between a company's tier 1 suppliers[2] and its own operations (including multi-modal shipping where multiple carriers are involved in the delivery of a product)
- Third-party transportation and distribution services purchased by the reporting company in the reporting year (either directly or through an intermediary), including inbound logistics, outbound logistics (e.g., of sold products), and third-party transportation and distribution between a company's own facilities

Emissions may arise from the following transportation and distribution activities throughout the value chain:

- Air transport
- Rail transport
- Road transport
- Marine transport
- Storage of purchased products in warehouses, distribution centers, and retail facilities

Outbound logistics services purchased by the reporting company are categorized as upstream because they are a purchased service. Emissions from transportation and distribution of purchased products upstream of the reporting company's tier 1 suppliers (e.g., transportation between a company's tier 2 and tier 1 suppliers) are accounted for in scope 3, category 1 (Purchased goods and services). Table 5.7 explains the scope and scope 3 category where each type of transportation and distribution activity should be accounted for.

Table 5.7 (from the *Scope 3 Standard*): Accounting for Emissions from Transportation & Distribution Activities in the Value Chain

Transportation and Distribution Activity in the Value Chain	Scope and Scope 3 Category
Transportation and distribution in vehicles and facilities owned or controlled by the reporting company	Scope 1 (for fuel use) or scope 2 (for electricity use)
Transportation and distribution in vehicles and facilities leased by and operated by the reporting company (and not already included in scope 1 or scope 2)	Scope 3, category 8 (Upstream leased assets)
Transportation and distribution of purchased products, upstream of the reporting company's tier 1 suppliers (e.g., transportation between a company's tier 2 and tier 1 suppliers)	Scope 3, category 1 (Purchased goods and services), since emissions from transportation are already included in the cradle-to-gate emissions of purchased products. These emissions are not required to be reported separately from category 1.
Production of vehicles (e.g., ships, trucks, planes) purchased or acquired by the reporting company	Account for the upstream (i.e., cradle-to-gate) emissions associated with

[2] Tier 1 suppliers are companies with which the reporting company has a purchase order for goods or services (e.g., materials, parts, components, etc.). Tier 2 suppliers are companies with which Tier 1 suppliers have a purchase order for goods and services (see figure 7.3).

	manufacturing vehicles in Scope 3, category 2 (Capital goods)
Transportation of fuels and energy consumed by the reporting company	Scope 3, category 3 (Fuel- and energy-related emissions not included in scope 1 or scope 2)
Transportation and distribution of products purchased by the reporting company, between a company's tier 1 suppliers and its own operations (in vehicles and facilities not owned or controlled by the reporting company) Transportation and distribution services purchased by the reporting company in the reporting year (either directly or through an intermediary), 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)	Scope 3, category 4 (Upstream transportation and distribution)
Transportation and distribution of products sold by the reporting company 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)	Scope 3, category 9 (Downstream transportation and distribution)

A reporting company's scope 3 emissions from transportation and distribution (upstream) include the scope 1 and 2 emissions of third party transportation companies.

This section first provides calculation guidance for transportation and then for distribution (e.g. warehouses, distribution centers, etc).

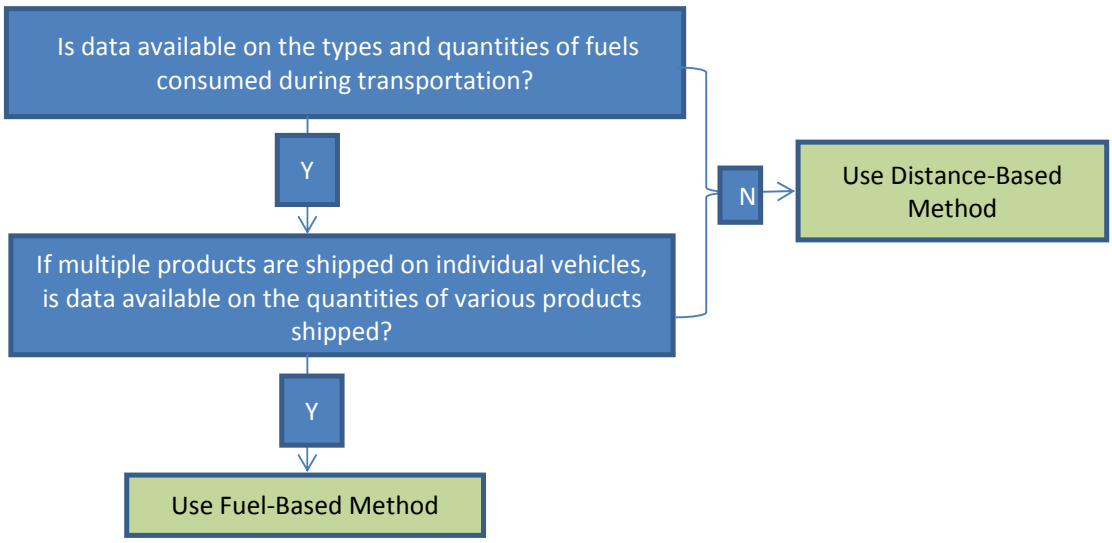
Calculating Emissions from Transportation (Upstream)

Companies may use either of two methods to calculate scope 3 emissions from transportation:

- **Fuel-Based Method**: involves determining the amount of fuel consumed (i.e. scope 1 and 2 emissions of transport providers) and applying the appropriate emissions factor for that fuel.

- **Distance-Based Method**: involves determining the mass, distance, and mode of each shipment, then applying the appropriate mass-distance emissions factor for the vehicle used.

Decision Tree for Selecting a Calculation Method



In certain cases, third party transportation providers may be able to provide product- or shipment-specific scope 1 and 2 emissions data directly to customers, in which case neither the fuel-based method nor distance-based method may be needed.

Option 1: Fuel-based method

The fuel-based method should be used when companies can obtain data for fuel use from transport providers (and, if applicable, refrigerant leakage due to refrigeration of products) from vehicle fleets (e.g., trucks, trains, planes, vessels). Companies should also take into account any additional energy and account for refrigerant loss due to refrigeration. Companies may optionally calculate any emissions from unladen backhaul.

Where fuel use data is unavailable, the company may derive fuel use by combining distance travelled and the vehicle's fuel efficiency. The fuel-based method is more accurate than the distance-based method because fuel consumption is directly related to emissions.

The fuel-based method is best applied if the vehicle exclusively ships the reporting company's purchased goods (i.e., exclusive use or truckload shipping, rather than less-than-truckload (LTL) shipping). Otherwise, emissions should be allocated between goods shipped for the reporting company and goods shipped for other companies.

Companies should allocate emissions based upon the following default limiting factors, unless more accurate data is available to show that another factor is the limiting factor:

- Road transport: Mass
- Marine transport: Volume
- Air transport: Mass
- Rail transport: Mass

Where data required for allocation is not available or reliable due to the variety of goods transported in one vehicle at the same time, the distance-based method should be used to calculate scope 3 emissions.

Activity Data Needed

Companies should collect data on:

- Quantities of fuel (e.g., diesel, gasoline, jet fuel, biofuels, etc.) consumed;
- Refrigerant leakage; and

If applicable:

- Distance travelled;
- Average fuel efficiency of the vehicle, expressed in units of liters of fuel consumed per tonne per kilometer transported;
- Mass of purchased goods in the vehicle (tonnes)

Emission Factors Needed

Companies should collect:

- Fuel emission factors, expressed in units of emissions per unit of energy consumed (e.g. kg CO_2e/liters, CO_2e/Btu, etc.)
- Refrigerant leakage emission factors, expressed in units of emissions per unit of refrigerant leaked (e.g. kg CO_2e/kg leakage)

Emission factors should include the life cycle emissions of the fuel (i.e., including not only emissions from combustion, but also emissions from the extraction, processing, and transportation of fuels to the point of use).

Note: For air travel emission factors, multipliers or other corrections to account for radiative forcing may be applied to the GWP of emissions arising from aircraft transport. If applied companies should disclose the specific factor used.

Data Collection Guidance

Data sources for activity data include:

- Aggregated fuel receipts
- Purchase records (provided by transportation providers); and/or
- Internal transport management systems

Data sources for emission factors include:

- Life cycle databases
- Company or supplier developed emission factors
- Industry associations

Calculation Formula - Upstream Transportation, Fuel-Based Method
Transport and Distribution emissions are calculated by multiplying each fuel/refrigerant type used by a corresponding emission factor and summing these together, as shown in the formula below:

Formula 1

CO_2e emissions for Transportation (Upstream) =
Sum across fuel types: $\sum Quantity\ of\ fuel\ consumed\ (litres)\ \times\ emission\ factor\ for\ the\ fuel\ (kg\ CO2e/litre)$ + Sum across refrigerant types: $\sum Quantity\ of\ refrigerant\ leakage\ (kg)\ \times\ emission\ factor\ for\ refrigerant\ (kg\ CO2e/kg)$

Companies should use the following formula to calculate quantities of fuel where fuel data is unavailable:

Formula 2

Quantities of fuel consumed (liters) =
Sum across transport steps: $Total\ distance\ travelled\ (km) \times$ fuel efficiency of vehicle (l/km)

Where allocation is needed, companies should calculate the allocated fuel use (for the goods shipped by the reporting company) using the formula below, and then apply Formula 1 above.

Formula 3

Allocated fuel use =
$= Total\ fuel\ consumed\ (litres)\ \times \left(\frac{Mass/Volume\ of\ Company's\ Goods}{Mass/Volume\ of\ Goods\ Transported}\right)$ Companies may optionally substitute mass of goods by volume, dimensional mass or chargeable mass where data is available to prove that the alternative method is more suitable. Dimensional mass is a calculated mass that takes into account packaging volume as well as the actual mass of the goods. Chargeable mass is higher value of either the actual or the dimensional mass of the goods.

Companies may optionally calculate emissions from unladen backhaul (i.e., the return journey of the empty vehicle), using the following formula:

CO_2e emissions from unladen backhaul =
For each fuel type: $\sum Quantity\ of\ fuel\ consumed\ from\ backhaul\ \times\ emission\ factor\ for\ the\ fuel\ (kg\ CO2e/litre)$

Where

$Quantity\ of\ fuel\ consumed\ from\ backhaul\ =$
$Average\ effiency\ of\ vehicles\ unladed\ (l/km) \times Total\ distance\ travelled\ unladen$

Calculation Resource

- GHG Protocol Calculation Tool, "Mobile Combustion GHG Emissions Calculation Tool. Version 2.0. June 2009" Developed by World Resources Institute, available at http://www.ghgprotocol.org.
- DEFRA GHG Conversion Factors, developed by the United Kingdom Department of Environment, Food and Rural Affairs (DEFRA), available at www.defra.gov.uk/environment/business/reporting/conversion-factors.htm

Example

Company A makes bread in Italy. Suppliers B, C and D supply raw materials for Company's A's operations. Company A collects activity data from suppliers on the amount of fuel used and refrigerant leakage incurred by the transport of raw materials to Company A's facility. All trucks transport goods exclusively for Company A. Company A collects emission factors for the fuel type used by suppliers and for refrigerant leakage.

This is summarised in the table below:

Supplier	Fuel Consumed (liters) or Refrigerant leakage (kg)	Fuel/Refrigerant Type	Emission Factor (kg CO_2e/liter
B	50,000	Diesel	3
C	80,000	Diesel	3
D	90,000	Diesel	3
D	50	Refrigerant R410a	2000

Note: The activity data and emissions factors are illustrative only, and do not represent actual data.

Emissions from diesel is calculated as:
$\sum Quantity\ of\ fuel\ consumed\ (litres)\ \times\ emission\ factor\ for\ the\ fuel\ (kg\ CO2e/litre)$
$= (50{,}000 \times 3) + (80{,}000 \times 3) + (90{,}000 \times 3)$
$= 660{,}000\ kg\ CO2e$

Emissions from refrigerant leakage is calculated as:
$\sum Quantity\ of\ refrigerant\ leakage\ (kg)\ \times\ emission\ factor\ for\ refrigerant\ (kg\ CO2e/kg)$
$= 50 \times 2{,}000$
$= 100{,}000\ kg\ CO2e$

Total emissions is calculated as follows:

$= emissions\ from\ fuels\ +\ emissions\ from\ refrigerant\ leakage$

$= 660{,}000 + 100{,}000$

$= 760{,}000\ kg\ CO2e$

Option 2: Distance-Based Method

In this method, distance is multiplied by mass of goods transported and relevant emission factors which incorporate average fuel consumption, average utilization, average size and mass of the vehicles and their associated carbon impacts.

Emissions factors for this method are typically represented in grams or kilograms of carbon dioxide equivalent per tonne-kilometer. Tonne-kilometer is a unit of measure representing one tonne of goods transported over one kilometer.
The distance based method is especially useful for any organization that does not have access to fuel or

mileage records from the transport vehicles, or has shipments smaller than those that would consume an entire vehicle or vessel.

This method generally requires less effort than the fuel based method as distance can be tracked using internal management systems or, if these are unavailable, online maps. However, accuracy is generally lower than the fuel based method as assumptions are made on the average fuel consumption, mass of goods and loading of vehicles.

Activity Data Needed

Companies should collect data on the distance travelled by transportation suppliers. This may be obtained by:

- Mass or volume of the products sold
- Actual distances provided by transportation suppliers
- Online maps or calculators; and/or
- Published port-to-port travel distances

The actual distances should be used when available, and each leg of the transportation supply chain should be collected separately.

Emission Factors Needed

Companies should collect:

- Emission factor by mode of transport (e.g. rail, air, etc) or vehicle types (e.g. articulated lorry, container vessel, etc), expressed in units of greenhouse gasses (CO_2, CH_4, N_2O) per unit of mass (tonne) or volume (e.g. TEU) travelled (e.g. km)

Common forms of emission factors are kg CO_2e/tonne/km for road transport or kg CO_2e/TEU/km for sea transport.

Note: For air travel emission factors, multipliers or other corrections to account for radiative forcing may be applied to the GWP of emissions arising from aircraft transport. If applied companies should disclose the specific factor used.

Data Collection Guidance

Companies may obtain activity data from:

- Purchase orders
- Specific carrier or mode operator
- Internal management systems
- Industry associations
- Online maps and calculators

Companies may obtain emission factors from:

- The GHG Protocol website www.ghgprotcol.org
- Government publications
- Industry associations
- Life cycle databases

When collecting emissions factors, it is important to note that they may be vehicle, regional or country specific.

Calculation Formula - Upstream Transportation, Distance-Based Method

To calculate emissions, companies should multiply the quantity of goods purchased in mass or volume by the distance travelled in the transport leg and then multiply that by an emission factor specific to the transport leg (usually a transport mode or vehicle type specific emission factor).

As each transport mode or vehicle type has a different emission factor, the transport legs should be calculated separately and total emissions aggregated.

The following formula can be applied to all modes of transport and/or vehicle types to calculate emissions from Transport (upstream):

CO_2e emissions for Transport (upstream) =
Sum across transport modes and/or vehicle types: $= \sum Mass\ of\ goods\ purchased\ (tonnes\ or\ volume\ ) \times\ Distance\ travelled\ in\ transport\ leg\ (km)$ $\times\ emission\ factor\ of\ transport\ mode\ or\ vehicle\ type\ (kg\ CO2e/tonne\ or\ volume/km)$ Each transport mode or vehicle type should be calculated separately and total emissions aggregated

Calculation Resources

- GHG Protocol Calculation Tool, "Mobile Combustion GHG Emissions Calculation Tool. Version 2.0. June 2009" Developed by World Resources Institute, available at http://www.ghgprotocol.org.
- US EPA Climate Leaders GHG Inventory Protocol, "Optional Emissions from Commuting, Business Travel and Product Transport," available at: http://www.epa.gov/stateply/documents/resources/commute_travel_product.pdf

Example: Distance-Based Method for Road Transport

Company A makes chairs and sources basic materials from suppliers B, C and D. Company A calculates total distance from the transport of the basic goods and obtains information from suppliers on vehicle type used for transport. Company A obtains relevant emission factors from lifecycle databases. The information is summarised in the table below:

Supplier	Mass of Transported Goods	Distance Transported (km)	Transport Mode or Vehicle Type	Emission Factor (kg CO_2e/tonne-km)
B	2	2,000	Truck (rigid, >3.5-7.5t)	0.2
C	1	3,000	Air (long haul)	1
D	6	4,000	Container 2000–2999 TEU	0.05

Emissions from road transport:

$$= \sum (Mass\ of\ goods\ purchased\ (tonnes) \times Distance\ travelled\ in\ transport\ leg \times emission\ factor\ of\ transport\ mode\ or\ vehicle\ type\ (kg\ CO2e/tonne-km))$$

$$= 2 \times 2{,}000 \times 0.2$$
$$= 800\ kg\ CO2e$$

Emissions from air transport

$$= \sum (Quantity\ of\ goods\ purchased\ (tonnes)\ x\ Distance\ travelled\ in\ transport\ leg\ x\ emission\ factor\ of\ transport /tonne-km))$$
$$= 1 \times 3{,}000 \times 1$$
$$= 3000\ kg\ CO2e$$

Emissions from sea transport

$$= \sum (Quantity\ of\ goods\ purchased\ (tonnes)\ x\ Distance\ travelled\ in\ transport\ leg\ x\ emission\ factor\ of\ transport /tonne-km))$$
$$= 6 \times 4{,}000 \times 0.05$$
$$= 1{,}200\ kg\ CO2e$$

Total emissions form transport (upstream) is calculated as

$$= emissions\ from\ road\ transport\ +\ emissions\ from\ air\ transport\ +\ emissions\ from\ sea\ transport$$
$$= 800\ +\ 3{,}000\ +\ 1{,}200$$
$$= 5{,}000\ kg\ CO2e$$

Data calculation guidance for the distance-based methodology

MODE	VEHICLE	UNIT	PRIMARY DATA SOURCES	SECONDARY DATA SOURCES	Comments	Assumptions
Air	Freighter short-haul	kg CO_2e/t-km	Carrier	ICAO UK Defra Environmental reports of air carriers LCA databases	Carrier can provide a) shipment specific emissions b) trade-line emissions based on existing network design and historical plane consumption c) emissions per type of plane	
	Freighter long- haul	kg CO_2e/t-km				
	Belly-freight short-haul	kg CO_2e/t-km				
	Belly-freight long-haul	kg CO_2e/t-km				
	Passenger plane short-haul	kg CO_2e/t-km				
	Passenger plane long-haul	kg CO_2e/t-km				
Ship	Container vessel <2000 TEU	kg CO_2e/TEU-km	Carrier	IMO CCWG LCA or EEIO databases	Carrier can provide a) shipment specific emissions b) trade-line emissions based on existing network design and historical vessel consumption c) emissions per type of vessel	Default 1 TEU = 10 t
	Container vessel 2000-5000 TEU	kg CO_2e/TEU-km				
	Container vessel 5000-8000 TEU	kg CO_2e/TEU-km				
	Container vessel >8000TEU	kg CO_2e/TEU-km				
	Bulk vessel <20000 dwt	kg CO_2e/t-km				
	Bulk vessel >20000 dwt	kg CO_2e/t-km				
Rail	Electric	kg CO_2e/t-km	Operator	EcoTransIT LCA or EEIO databases	Operator can provide shipment specific emissions or trade-line historical emissions	
	Diesel	kg CO_2e/t-km				
Truck	Van <3.5t	kg CO_2e/t-km	Trucker	EcoTransIT NTM TREMOVE (EU) EPA Smart Way (US) LCA or EEIO databases	Trucker can provide a) shipment specific emissions b) trade-line emissions based on existing network design and historical fleet consumption c) emissions per type of truck	Default 1 TEU = 10 t
	Truck 3.5-7.5t	kg CO_2e/t-km				
	Truck 7.5t-16t	kg CO_2e/t-km				
	Truck 16t-32t single axle	kg CO_2e/t-km kg CO_2e/TEU-km				
	Truck >32t tractor and trailer or flatbed	kg CO_2e/t-km kg CO_2e/TEU-km				
Warehouse	Dry warehouse	kg CO_2e/pallet-day kg CO_2e/TEU-day kg CO_2e/cbm-day kg CO_2e/kg-day	Operator	LCA or EEIO databases	Operator may also have the emission factor based on the warehouse surface	1 pallet = 1 square meter of floor space
	Refrigerated warehouse	kg CO_2e/pallet-day kg CO_2e/TEU-day kg CO_2e/cbm-day kg CO_2e/kg-day				
Terminal	Terminal	kg CO_2 e/t kg CO_2e/TEU	Terminal owner	LCA or EEIO databases		1 TEU = 10 t

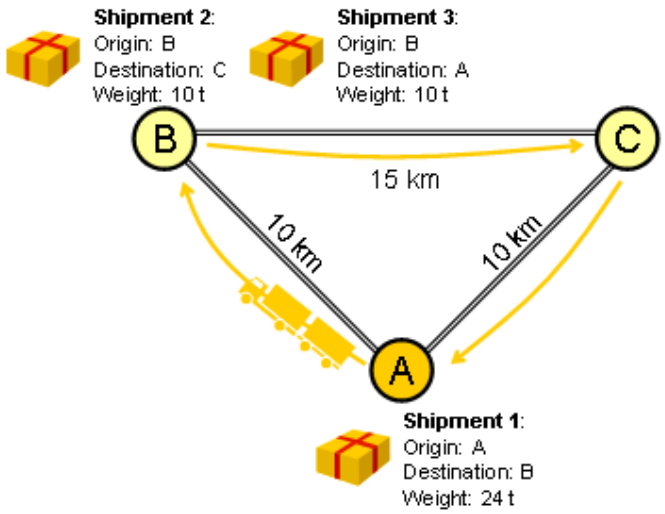
Notes:

- ICAO = International Civil Aviation Organization
- IMO = International Maritime Organization
- CCWG = Clean Cargo Working Group
- TEU = twenty foot equivalent units, a measure of the size of shipping containers. One standard-size container is 1 TEU.

Deutsche Post DHL: Using the right key to allocate emissions from freight transportation

Deutsche Post DHL is the world's leading mail and logistics group and the first globally operating logistics company to set itself a quantitative CO_2 efficiency target. Especially for subcontracted transportation, the choice of appropriate calculation methods and allocation factors are critical decision points to ensure a fair calculation and allocation of emissions. The following example will demonstrate a typical situation, where different allocation factors may lead to completely different results.

This example is about a typical "milk run", where a truck needs to stop at different locations to pick up or drop off shipments. In this example a 24t shipment (1) needs to be transported from a home station (A) to a customer (B). At customer (B), shipment (1) is unloaded and shipments (2) and (3) are being picked up. Shipment (2) is addressed to customer (C) and shipment (3) needs to be transported back to the home station (A). Emitting on an average 900g CO_2 per km, 31.5 kg CO_2 are being emitted during this milk run. How can we allocate these emissions to the shipments?



I. Allocation using driven tonne kilometers

One option for allocation is to use driven tonne kilometers (tkm) as an allocation factor. For calculating the tonne kilometers, the weight of each shipment is multiplied by the distance driven. Afterwards the total amount of CO_2 emissions is allocated to the shipments on the basis of their share in the driven tonne kilometers.

	Shipment 1	Shipment 2	Shipment 3	Total
Driven tkm	240 tkm	150 tkm	250 tkm	640 tkm
Total emissions				31.5 kg CO_2
Allocation factor				49 g CO_2 per tkm
Shipment emissions	11.8 kg CO_2	7.4 kg CO_2	12.3 kg CO_2	31.5 kg CO_2

Surprisingly, shipment (2) which causes the longest transportation leg (15 km), receives minimum emissions and shipment (3) is "punished" for being transported jointly with shipment (2) via customer (C). The allocation does not consider what a shipment really caused itself. The next option shows how such downsides can be mitigated.

II. Allocation using shortest theoretical distance (Great Circle Distance)

The second option in this example aims at allocating CO_2 emissions using the shortest theoretical distance between the origin and destination of each shipment (Great Circle Distance) as an allocation factor. The shipments' CO_2 allocation is independent from the actual driven distance because that is of no relevance for the customer. Similar as for the example above, tonne kilometers are calculated – this time using the GCD between a shipment's origin and destination – before performing the allocation.

	Shipment 1	Shipment 2	Shipment 3	Total
Tkm based on GCD	240 tkm	150 tkm	100 tkm	490 tkm
Total emissions				31.5 kg CO_2
Allocation factor				64 g CO_2 per tkm
Shipment emissions	15.43 kg CO_2	9.64 kg CO_2	6.43 kg CO_2	31.5 kg CO_2

As the allocation of emissions for individual items is only based on the characteristics of the individual shipments, this option provides a method for a very fair allocation.

Although there are many more options to perform the allocation to shipments in freight transports, this short example illustrates which pitfalls a user can easily run into, just by picking a different allocation key.

Calculating Emissions from Distribution (Upstream)

Companies may use either of two methods to calculate scope 3 emissions from distribution (upstream):

- **Site-Specific Method**: involves site-specific fuel, electricity and refrigerants data and applying the appropriate emissions factors.

- **Average-Data Method**: involves estimating emissions for each distribution event, based on average data, such as average emissions per pallet or m3 stored per day.

Option 1: Site-Specific Method

This method involves collecting site-specific fuel and energy data from the storage facility (e.g. warehouses, distribution centres, etc) of individual distribution events, and multiplying them by appropriate emission factors.

Where the storage facility stores goods for companies other than the reporting company, emissions should be allocated to those belonging to the reporting company. For more information on allocation, see Chapter 8 of the *Scope 3 Standard*.

Activity Data Needed

Companies should collect data on:

- Site-specific fuel, electricity use; and
- Site-specific refrigerant leakage

Emission Factors Needed:

Companies should collect:

- Site or regionally specific emission factors for energy sources (e.g. electricity and fuels) per unit of consumption (e.g. kg CO_2e/kWh for electricity, kg CO_2e/liter for diesel); and
- Emission factors of fugitive and process emissions (kg CO_2e/kg)

Data Collection Guidance

Data sources for activity data include:

- Utility bills
- Purchase records
- Meter readings
- Internal IT systems

Data sources for emission factors include:

- Life cycle databases
- Company developed emission factors
- Industry associations

Calculation Formula - Upstream Distribution, Site-Specific Method

CO_2e emissions for Distribution (upstream) =

For each storage facility:

$$Emissions\ of\ storage\ facility\ (kg\ CO2e) =$$
$$(Fuel\ Consumed\ \ (kWh) \times\ Fuel\ Emission\ Factor\ \ (kg\ CO2e/kWh)) +$$
$$(Electricity\ Consumed\ \ (kWh) \times\ Electricity\ Emission\ Factor\ \ (kg\ CO2e)/kWh) +$$
$$(Refrigerant\ leakage\ (kg) \times\ Refrigerant\ Emission\ Factor\ \ (kg\ CO2e)/kg))$$

Then, allocate emissions based on volume that company's products take within storage facility:

$$Allocated\ emissions\ of\ storage\ facility\ =$$
$$\frac{Volume\ of\ reporting\ company's\ purchased\ goods\ (m3)}{Total\ volume\ of\ goods\ in\ storage\ facility\ (m3)} \times\ Emissions\ of\ storage\ facility\ (kg\ CO2e)$$

Finally, sum across all storage facilities:

$$\sum Allocated\ emissions\ of\ storage\ facility$$

Where data is available, companies may optionally allocate emissions based upon different storage methods (e.g. temperature controlled storage and ambient storage). This allocation step can be significant within shared storage.

In some circumstances, companies may optionally allocate emissions based on length of time goods spend in storage. For example, if a company stores refrigerated goods for prolonged periods in a warehouse that stores predominately fast moving ambient goods.

In the case where companies have a large number of distribution channels sampling may be appropriate (see section 0.4 for more information).

Example

Company A's products are stored at two different facilities across the country throughout the reporting year. No chilling or freezing are needed during storage. Company A collects the data from operators on the amount of fuel, electricity consumed for the reporting year, as well as the volume of company A's purchased goods compared to total volume of goods. Company A collects corresponding emission factors from lifecycle databases.

The information is summarised in the table below:

Storage Facility	Electricity consumed (kWh)	Electricity emission Factor (kg CO_2e/kWh)	Natural gas used (kWh)	Natural gas emission Factor (kg CO_2e/kWh)	Volume of Company A's goods (m3)	Total volume of goods in storage facility (m3)
1	10,000	0.8	1,000	0.25	100	400
2	15,000	0.8	2,000	0.25	200	800

Note: the activity data and emissions factors are illustrative only, and do not refer to actual data.

Emissions from Storage Facility 1 are calculated as:

$$= ((Fuel\ Consumed\ \ (kWh) \times\ Fuel\ Emission\ Factor\ \ (kg\ CO2e)/kWh)) + (Electricity\ Consumed\ \ (kWh) \times\ Electricity\ Emission\ Factor\ \ (kg\ CO2e)/kWh)) \times \frac{Volume\ of\ reporting\ company's\ purchased\ goods\ (m3)}{Total\ volume\ of\ goods\ in\ storage\ facility\ (m3)}$$

$$= \left((10{,}000 \times 0.8) + (1{,}000 \times 0.25)\right) \times \left(\frac{100}{400}\right)$$

$$= 2{,}062.5\ kg\ CO2e$$

Emissions from Storage Facility 2 are calculated as:

$$= ((Fuel\ Consumed\ \ (kWh) \times\ Fuel\ Emission\ Factor\ \ (kg\ CO2e)/kWh)) + (Electricity\ Consumed\ \ (kWh) \times\ Electricity\ Emission\ Factor\ \ (kg\ CO2e)/kWh)) \times \frac{Volume\ of\ reporting\ company's\ purchased\ goods\ (m3)}{Total\ volume\ of\ goods\ in\ storage\ facility\ (m3)}$$

$$= \left((15{,}000 \times 0.8) + (2{,}000 \times 0.25)\right) \times \left(\frac{200}{800}\right)$$

$$= 3{,}125\ kg\ CO2e$$

Total emissions from distribution (upstream) is calculated as follows:

$$= Emissions\ from\ storage\ facility\ 1\ +\ emissions\ from\ storage\ facilities\ 2$$

$$= 2{,}062.5 + 3{,}125$$

$$= 5{,}187.5\ kg\ CO2e$$

<u>Option 2: Average-Data Method</u>

Companies should use the Average-Data Method where supply-chain specific data is unavailable. Companies should collect average emission factors for distribution events.

Activity Data Needed

Companies should collect data based upon the throughput

- Volume of purchased goods, or
- Number of pallets needed to store purchased goods

Emission Factors Needed

Companies should collect data which allows the calculation of emissions per unit stored. This can be expressed in several different ways, including;

- Emission factor per pallet stored in facility
- Emission factor per m2/m3 stored in facility
- Emission factor per TEU (twenty-foot equivalent unit) stored in facility

Where storage facilities are shared companies may optionally choose to further allocate emissions based upon the time spent within the storage facility.

Data Collection Guidance

Data sources for activity data include:

- Supplier records
- Internal management systems

Data sources for emission factors include:

- Life cycle databases
- Supplier or company developed emission factors
- Industry associations (for example the U.S. Energy information Administration has developed a dataset on average energy use by building type. Commercial Buildings Energy Consumption Survey, at http://www.eia.doe.gov/emeu/cbecs/
- Academic publications

Calculation Formula - Upstream Distribution, Average-Data Method

CO_2e emissions for Distribution (Upstream)=
Sum across storage facilities: $\sum Volume\ stored\ goods\ in\ reporting\ year\ (m3) \times Emission\ Factor\ for\ storage\ faciltiy\ (kg\ CO2e/m3)$ OR $\sum Total\ number\ of\ pallets\ stored\ (pallets) \times Emissions\ Factor\ for\ stored\ pallet\ (kg\ CO2e/pallet)$

Example:

Company A is a producer of pasta. Its products are stored at a distribution centres and then sent for retail in a supermarket. Company A collects data on the total volume needed to store its goods at storage facilities. Emission factors are collected from an academic publication.
The information is summarised in the following table:

Storage Facility Types	Total volume of stored goods (m3)	Emission factor of storage (kg CO_2e/m3)
Distribution Centre	4000	0.5
Supermarkets	4000	1

The emissions can be calculated as follows:

$\sum Volume\ stored\ goods\ in\ reporting\ year\ (m3) \times Emission\ Factor\ for\ storage\ faciltiy\ (kg\ CO2e/m3)$

= (4,000 × 0.5) + (4,000 × 1)
= 2,000 + 4,000
= 6,000 kg CO2e

1 **Summary of Calculation Methods for Category 4 (Upstream transportation and distribution)**

Method	Calculation Formula	Activity Data Needed	Emission Factor Needed
Calculating Emissions from Transportation			
1.Fuel-Based Method	**CO_2e emissions for Transportation (Upstream) =** Sum across fuel types: $\sum Quantity\ of\ fuel\ consumed\ (litres)\ \times\ emission\ factor\ for\ the\ fuel\ (kg\ CO2e/litre)$ + Sum across refrigerant types: $\sum Quantity\ of\ refrigerant\ leakage\ (kg)\ \times\ emission\ factor\ for\ refrigerant\ (kg\ CO2e/kg)$ **Quantities of fuel consumed (liters) =** Sum across transport steps: $Total\ distance\ travelled\ (km)$ × fuel efficiency of vehicle (l/km) **Allocated fuel use =** $= Total\ fuel\ consumed\ (litres)\ \times \left(\frac{Mass/Volume\ of\ Company's\ Goods}{Mass/Volume\ of\ Goods\ Transported}\right)$ Companies may optionally substitute mass of goods by volume, dimensional mass or chargeable mass where data is available to prove that the alternative method is more suitable. Dimensional mass is a calculated mass that takes into account packaging volume as well as the actual mass of the goods. Chargeable mass is higher value of either the actual or the dimensional mass of the goods. **(Optional) CO_2e emissions from unladen backhaul =** For each fuel type: $\sum Quantity\ of\ fuel\ consumed\ from\ backhaul\ \times\ emission\ factor\ for\ the\ fuel\ (kg\ CO2e/litre)$ Where $Quantity\ of\ fuel\ consumed\ from\ backhaul\ =$ $Average\ effiency\ of\ vehicles\ unladed\ (l/km) \times Total\ distance\ travelled\ unladen$	• Quantities of fuel (e.g., diesel, gasoline, jet fuel, biofuels, etc.) consumed; • Refrigerant leakage; and If applicable: • Distance travelled; • Average fuel efficiency of the vehicle, expressed in units of liters of fuel consumed per tonne per kilometer transported; • Mass of purchased goods in the vehicle (tonnes)	• Fuel emission factors, expressed in units of emissions per unit of energy consumed (e.g. kg CO_2e/liters, CO_2e/Btu, etc.) • Refrigerant leakage emission factors, expressed in units of emissions per unit of refrigerant leaked (e.g. kg CO2e/kg leakage) Emission factors should include the life cycle emissions of the fuel
2.Distance-Based Method	Sum across transport modes and/or vehicle types: $= \sum Mass\ of\ goods\ purchased\ (tonnes\ or\ volume\ ) \times\ Distance\ travelled\ in\ transport\ leg\ (km)$	• Mass or volume of the products sold • Actual distances	Emission factor by mode of transport (e.g. rail, air, etc) or vehicle types (e.g.

	$\times$ $emission\ factor\ of\ transport\ mode\ or\ vehicle\ type\ (kg\ CO2e/tonne\ or\ volume/km)$ Each transport mode or vehicle type should be calculated separately and total emissions aggregated	provided by transportation suppliers • Online maps or calculators; and/or • Published port-to-port travel distances	articulated lorry, container vessel, etc), expressed in units of greenhouse gasses (CO_2, CH_4, N_2O) per unit of mass (tonne) or volume (e.g. TEU) travelled (e.g. km)
Calculating Emissions from Distribution			
1.Site-Specific Method	For each storage facility: $Emissions\ of\ storage\ facility\ (kg\ CO2e) =$ $(Fuel\ Consumed\ \ (kWh) \times\ Fuel\ Emission\ Factor\ \ (kg\ CO2e/kWh))$ $+ (Electricity\ Consumed\ \ (kWh)$ $\times\ Electricity\ Emission\ Factor\ \ (kg\ CO2e)/kWh) + (Refrigerant\ leakage\ (kg)$ $\times\ Refrigerant\ Emission\ Factor\ \ (kg\ CO2e)/kg))$ Then, allocate emissions based on volume that company's products take within storage facility: $Allocated\ emissions\ of\ storage\ facility\ =$ $\frac{Volume\ of\ reporting\ company's\ purchased\ goods\ (m3)}{Total\ volume\ of\ goods\ in\ storage\ facility\ (m3)}$ $\times\ Emissions\ of\ storage\ facility\ (kg\ CO2e)$ Finally, sum across all storage facilities: $\sum Allocated\ emissions\ of\ storage\ facility$	• Site-specific fuel, electricity use; and • Site-specific refrigerant leakage	• Site or regionally specific emission factors for energy sources (e.g. electricity and fuels) per unit of consumption (e.g. kg CO_2e/kWh for electricity, kg CO_2e/liter for diesel); and • Emission factors of fugitive and process emissions (kg CO_2e/kg)
2.Average-Data Method:	Sum across storage facilities: $\sum Volume\ stored$ $goods\ in\ reporting\ year\ (m3)\ \times\ Emission\ Factor\ for\ storage\ faciltiy\ (kg\ CO2e/m3)$ OR $\sum Total\ number\ of\ pallets\ stored\ (pallets)$ $\times\ Emissions\ Factor\ for\ stored\ pallet\ (kg\ CO2e/pallet)$	Companies should collect data based upon the throughput • Volume of purchased goods, or • Number of pallets needed to store purchased goods	Companies should collect data which allows the calculation of emissions per unit stored. This can be expressed in several different ways, including; • Emission factor per pallet stored in facility • Emission factor per m^2/m^3 stored in facility • Emission factor per TEU (twenty-foot equivalent unit) stored in facility

Category 5. Waste Generated in Operations

Category Description

This category includes emissions from third-party disposal and treatment of waste that is generated in the reporting company's owned or controlled operations in the reporting year. This category includes emissions from disposal of both solid waste and wastewater. Only waste treatment in facilities owned or operated by third parties is included in scope 3. Waste treatment at facilities owned or controlled by the reporting company is accounted for in scope 1 and scope 2. Treatment of waste generated in operations is categorized as an upstream scope 3 category because waste management services are purchased by the reporting company.

This category includes all future emissions that result from waste generated in the reporting year. (See section 5.4 for more information on the time boundary of scope 3 categories.)

Waste treatment activities may include:

- Disposal in a landfill
- Disposal in a landfill with landfill-gas-to-energy (LFGTE) – i.e., combustion of landfill gas to generate electricity
- Recovery for recycling
- Incineration
- Composting
- Waste-to-energy (WTE) or energy-from-waste (EfW) – i.e., combustion of municipal solid waste (MSW) to generate electricity
- Wastewater treatment

Companies may optionally include emissions from transportation of waste.

A reporting company's scope 3 emissions from waste generated in operations include the scope 1 and scope 2 emissions of solid waste and wastewater management companies.

Accounting for emissions from recycling

Companies (e.g., plastic bottle manufacturers) may both purchase materials with recycled content (e.g., plastic) and sell products that are recyclable (e.g., plastic bottles). In this case, accounting for emissions from the recycling processes both upstream and downstream would double count emissions from recycling. To avoid double counting of emissions from recycling processes by the same company, companies should account for upstream emissions from recycling processes in category 1 and category 2 when the company purchases goods or materials with recycled content. In category 5 and category 12, companies should account for emissions from recovering materials at the end of their life for recycling, but should not account for emissions from recycling processes themselves (these are instead included in category 1 and category 2 by purchasers of recycled materials).

Companies should not report negative or avoided emissions associated with recycling in category 5 or category 12. Any claims of avoided emissions associated with recycling should not be included in, or deducted from, the scope 3 inventory, but may instead be reported separately from scope 1, scope 2, and scope 3 emissions. Companies that report avoided emissions should also provide data to support the claim that emissions are avoided (e.g., that recycled materials are collected, recycled, and used) and report the methodology, data sources, system boundary, time period, and other assumptions used to calculate avoided emissions. For more information on avoided emissions, see section 9.5.

Calculating Emissions from Waste Generated in Operations

This guidance provides methods to calculate a company's scope 3 emissions from waste.

This document provides guidance for data collection techniques to allow companies to calculate emissions from waste dependent on the data available. To calculate emissions from waste in greater detail, calculation methods can be found in *2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 5 Waste*.

The emissions from waste generated in operations are likely to produce the following greenhouse gases:

- CO_2 – Both fossil and biogenic
- CH_4 – Principally from decomposition of biogenic materials in landfill or waste to energy technologies

Emissions from wastewater should also be accounted for. Emissions from wastewater are highly variable depending on how much processing is needed to treat the water (determined by Biological Oxygen Demand (BOD) and/or Chemical Oxygen Demand (COD)). The following industries often have higher emissions from wastewater (where wastewater is not treated onsite).

- Starch refining
- Alcohol refining
- Pulp and Paper
- Vegetable, Fruits and Juices

For Meat and Poultry reporting companies operating within these industries it is suggested that the emissions of wastewater are calculated based upon the IPCC methodology (*2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 5 Waste*.)

Where waste is recycled, reporting companies should use an emission factor of zero (note: this emission factor should not be negative)

Calculation Method

There are two main methods for calculating emissions from waste generated in operations:

- **Waste-Type Specific method:** Companies can use emission factors for specific waste types and waste treatment methods.
- **Average-Data Method:** Emissions based upon total waste diversion methods for the reporting company

In certain cases, third party waste treatment companies may be able to provide waste-specific scope 1 and 2 emissions data directly to customers (e.g., for incineration, recovery for recycling, etc.), in which case neither the waste-type specific method nor average-data method may be needed.

Option 1: Waste-type Specific Method:

Emissions from waste are dependent on the type of waste which is being disposed of, and the waste diversion method. Therefore where available companies should differentiate waste based upon:

- Type of waste (e.g. cardboard, food-waste, wastewater)
- Waste treatment method (e.g. incinerated, landfilled, recycled, wastewater)

Activity Data Needed

Companies should collect:

- Waste produced (e.g. tonne, m3) and type of different waste generated in operations
- For each waste type, specific waste treatment method applied (e.g. landfilled, incinerated, recycled, etc)

As many waste operators charge for waste by disposal method this may be collected from utility bills. The information may also be stored on internal IT systems

Emission Factors Needed

Companies should collect:

- Waste type and waste treatment specific emission factors based upon the individual waste types, and how these waste types are treated

Data sources for emission factors include:

- Life cycle databases
- Industry associations
- Calculated emission factors using IPCC Guidelines (*2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 5)*

Calculation Formula - Waste Generated in Operations, Waste-Type Specific method

Emissions from Waste Generated in Operations=
Sum across waste types: $\sum Waste\ Produced\ (tonnes) \times Waste\ type\ and\ waste\ treatment\ specific\ emission\ factor\ (kg\ CO2e/tonne)$

Example

Company A manufactures plastic components. They produce both solid waste and wastewater they also produce a high volume of water waste in the manufacturing process. The company collects data on the different types of waste produced, and how this waste is treated.
Emission factors are then sourced for each of the waste types.

Waste Type	Waste Produced	Waste Treatment	Waste Type and Waste Treatment Specific Emission Factor
Plastic	450 tonnes	Incinerated	400 kg CO_2e/tonne
Plastic	2000 tonnes	Landfill	100 kg CO_2e/tonne
Water disposal	5000 m3	Wastewater	0.5 kg CO_2e/m3

$\sum Waste\ Produced\ (tonnes) \times$
$Waste\ type\ and\ waste\ treatment\ specific\ emission\ factor\ \ (kg\ CO2e/tonne)$
$= (450 \times\ 400) + (2{,}000\ \times 100) + (5{,}000 \times\ 0.5)$
$=\ 382{,}500\ kg\ CO2e$

Option 2: Average-Data Method

Companies using the Average-Data Method should collect data based upon the total waste diversion rates from the reporting organisation. This is often preferable where the type of waste produced is unknown.

Activity Data Needed

Companies should collect:

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

As many waste operators charge for waste by disposal method this may be collected from utility bills. The information may also be stored on internal IT systems.

Emission Factors Needed

Companies should collect:

- Average waste treatment specific emission factors based upon all waste disposal types

Data sources for emission factors include:

- Life cycle databases
- National inventories

Calculation Formula - Waste Generated in Operations, Average-Data Method

Emissions from Waste Generated in Operations
Sum across waste treatment methods: $\sum Total\ mass\ of\ waste\ (tonnes)$ $\times\ proportion\ of\ total\ waste\ being\ treated\ by\ waste\ treatment\ method$ $\times\ emission\ factor\ of\ waste\ treatment\ method\ (kg\ CO2e/tonne)$

Example

Company A is a telesales centre. The company does not have sufficient information to allow the waste-type specific data method. Company A therefore collects data on the total waste collected,

and how that waste is treated and average emission factors for waste diversion methods:

Total Waste Produced (tonnes)	Waste Treatment	Proportion	Average Emission Factor of Waste Treatment Method
40	Landfill	25%	300 kg CO_2e/tonne
	Incinerated	5%	1200 kg CO_2e/tonne
	Recycled	50%	0 kg CO_2e/tonne
	Composted	20%	30 kg CO_2e/tonne

$$\sum Total\ mass\ of\ waste\ (tonnes) \times$$
$$proportion\ of\ total\ waste\ being\ treated\ by\ waste\ treatment\ method \times$$
$$emission\ factor\ of\ waste\ treatment\ method\ (kg\ CO2e/tonne)$$
$$= (40 \times 0.25 \times 300) + (40 \times 0.05 \times 1{,}200) + (40 \times 0.5 \times 0) + (40 \times 0.2 \times 30)$$
$$= 5{,}640\ kg\ CO2e$$

Summary of Calculation Methods for Category 5 (Waste generated in operations)

Method	Calculation Formula	Activity Data Needed	Emission Factor Needed
1. Waste-Type Specific Method:	Sum across waste types: $\sum Waste\ Produced\ (tonnes) \times Waste\ type\ and\ waste\ treatment\ specific\ emission\ factor\ (kg\ CO2e/tonne)$	• Waste produced (e.g. tonne, m3) and type of different waste generated in operations • For each waste type, specific waste treatment method applied (e.g. landfilled, incinerated, recycled, etc)	• Waste type and waste treatment specific emission factors based upon the individual waste types, and how these waste types are treated
2. Average-Data Method:	Sum across waste treatment methods: $\sum Total\ mass\ of\ waste\ (tonnes) \times proportion\ of\ total\ waste\ being\ treated\ by\ waste\ treatment\ method \times emission\ factor\ of\ waste\ treatment\ method\ (kg\ CO2e/tonne)$	• Total mass of waste generated in operations • Proportion of this waste being treated by different methods (e.g. % landfilled, incinerated, recycled, etc)	• Average waste treatment specific emission factors based upon all waste disposal types

Category 6: Business Travel

Category Description

This category includes emissions from the transportation of employees for business-related activities in vehicles owned or operated by third parties, such as aircraft, trains, buses, and passenger cars.

Emissions from transportation in vehicles owned or controlled by the reporting company are accounted for in either scope 1 (for fuel use) or scope 2 (for electricity use). Emissions from leased vehicles operated by the reporting company not included in scope 1 or scope 2 are accounted for in scope 3, category 8 (Upstream leased assets). Emissions from transportation of employees to and from work are accounted for in scope 3, category 7 (Employee commuting).

Emissions from business travel may arise from:

- Air travel
- Rail travel
- Bus travel
- Automobile travel (e.g., business travel in rental cars or employee-owned vehicles other than employee commuting to and from work)
- Other modes of travel

Companies may optionally include emissions from business travelers staying in hotels.

A reporting company's scope 3 emissions from business travel include the scope 1 and scope 2 emissions of transportation companies (e.g., airlines).

Calculating Emissions from Business Travel

Calculating emissions from business travel involves multiplying activity data (i.e., vehicle-kilometers or person-kilometers travelled by vehicle type) by emission factors (typically default national emission factors by vehicle type). Vehicle types include all categories of aircraft, rail, subway, bus, automobile, etc.

Employees should be taken in its widest sense to include permanent, part-time and contract employees, whether working full-time or part-time.

Calculation Method: Distance-Based Method

Companies should follow the steps below:

Activity Data Needed

Companies should collect data on:

- Total distance travelled by each mode of transport (air, train, bus, car, etc.) for all employees in the reporting year.

Where possible, companies should also collect:

- Countries of travel (since transportation emission factors vary by country)
- Specific types of vehicles used for travel (since transportation emission factors vary by vehicle types) from transport providers

Companies may optionally collect data on the number of hotel nights incurred during business travel, by hotel type.

Activity data should be expressed as the number of kilometers travelled or kilometers travelled per person for a particular vehicle type e.g. passenger-kilometer. The activity data should be summed to obtain total annual kilometers or person-kilometers travelled by each vehicle type used by the company.

Emission Factors Needed

Companies should collect:

- Emission factors that represent kilograms of CO_2e emitted per kilometer or passenger-kilometer for each mode of transport (e.g. aircraft, rail, metro, bus, taxi, bus, etc.)

Companies may optionally use emission factors for hotel stays, by hotel type (e.g., kilograms of CO_2e emitted per hotel night).

Note: For air travel emission factors, multipliers or other corrections to account for radiative forcing may be applied to the GWP of emissions arising from aircraft transport. If applied companies should disclose the specific factor used.

Data Collection Guidance

Methods of data collection include:

- Automatic tracking of distance travelled by mode through a travel agency or other travel providers
- Automatic tracking of distance travelled by mode through internal expense and reimbursement systems, which may require adding new questions on distance travelled and mode of transport to travel or expense forms submitted by employees
- Annual surveys/questionnaires of employees
- Working with travel providers (e.g., transportation companies, hotels) to obtain GHG emissions data

Collecting travel data from all employees may not be feasible. In such a case, companies may extrapolate from a representative sample of employees to represent the total business travel of all employees. For example, a company may have 4,000 employees, who each have different travelling profiles. In such cases, companies may extrapolate from a representative sample of 400 employees to approximate the total business travel of all employees. See section 0.4 for more information. Companies may also choose to group or combine data from business travellers that have similar travelling profiles.

Calculation Formula - Business Travel, Distance-Based Method

Once the company has determined total annual distance travelled by each mode of transport (aggregated across all employees), apply the formula below to calculate emissions.

CO_2e emissions for business travel =

Sum across vehicle types

$$\sum distance\ traveled\ by\ vehicle\ type\ (vehicle-km\ or\ passenger-km) \times vehicle\ specific\ emission\ factor\ (kg\ CO2e/vehicle-km\ or\ kg\ CO2e/passenger-km)$$

+

(optional)

$$\sum annual\ number\ of\ hotel\ nights\ (nights)\ \times hotel\ emission\ factor\ (kg\ CO2e/night)$$

Calculation Resources:

- GHG Protocol Calculation Tool, "Mobile Combustion GHG Emissions Calculation Tool. Version 2.0. June 2009" Developed by World Resources Institute, available at http://www.ghgprotocol.org.
- US EPA Climate Leaders GHG Inventory Protocol, "Optional Emissions from Commuting, Business Travel and Product Transport," available at: nohttp://www.epa.gov/stateply/documents/resources/commute_travel_product.pdf

Example

Company A is a financial services company. Every year, it sends groups of professionals to industry conferences in the UK, Australia and the USA. For each group, the company has collected activity data on the typical distances travelled and modes of transport.

Data was collected via employee questionnaires and information provided by travel agencies and transportation companies. It is assumed that each member of the group travelled the same amount in the same business trip.

		Road Travel					Air Travel		
Employee Group	Number of Employees in group	Car Type	Average employees per vehicle	Location	Distance (km)	Emission Factor (kg CO_2e/vehicle-km)	Flight Type	Distance (km)	Emission Factor (kg CO_2e/passenger-km)
Group 1	10	Hybrid	2	US	50	1	Long haul	10,000	5
Group 2	20	Average petrol car	2	Australia	200	2	Short haul	15,000	6
Group 3	100	Four wheel drive	3	US	100	4	Long haul	12,000	5

Note: the activity data and emission factors in this example are for illustrative purposes only.

Total business travel emissions of Company A can be calculated as follows:

Emissions from road travel

$$= \sum distance\ traveled\ by\ vehicle\ type\ (vehicle - km\ or\ passenger - km) \times vehicle\ specific\ emission\ factor\ (kg\ CO2e/vehicle - km\ or\ kg\ CO2e/passenger - km)$$

$$= \left(\frac{10}{2} \times 50\ \times 1\right) + \left(\frac{20}{2} \times 200\ \times 2\right) + \left(\frac{100}{3} \times 100\ \times 4\right)$$

$$= 17{,}583.33\ kg\ CO2e$$

Emissions from air travel

$$= \sum distance\ traveled\ by\ vehicle\ type\ (vehicle - km\ or\ passenger - km) \times vehicle\ specific\ emission\ factor\ (kg\ CO2e/vehicle - km\ or\ kg\ CO2e/passenger - km)$$

$$= (10 \times 10000\ \times 5) + (20\ \times 15000\ \times 6) + (100\ \times 12000\ \times 5)$$

$$= 8{,}300{,}000\ kg\ CO2e$$

Total emissions from employee travel

$$= emissions\ from\ road\ travel\ +\ emissions\ from\ air\ travel$$

$$= 17{,}583.33 + 8{,}300{,}000$$

$$= 8{,}317{,}583.33\ kg\ CO2e$$

Summary of Calculation Methods for Category 6 (Business travel)

Method	Calculation Formula	Activity Data Needed	Emission Factor Needed
Distance-Based Method	Sum across vehicle types $\sum$ *distance traveled by vehicle type* (*vehicle* − *km or passenger* − *km*) × *vehicle specific emission factor* (*kg CO2e/vehicle* − *km or kg CO2e/passenger* − *km*) + (optional) $\sum$ *annual number of hotel nights* (*nights*) × *hotel emission factor* (*kg CO2e/night*)	• Total distance travelled by each mode of transport (air, train, bus, car, etc.) for all employees in the reporting year. • Countries of travel (since transportation emission factors vary by country) • Specific types of vehicles used for travel (since transportation emission factors vary by vehicle types) from transport providers	Emission factors that represent kilograms of CO_2e emitted per kilometer or passenger-kilometer for each mode of transport (e.g. aircraft, rail, metro, bus, taxi, bus, etc.)

Category 7: Employee Commuting

Category Description

This category includes emissions from the transportation of employees[3] between their homes and their worksites.

Emissions from employee commuting may arise from:

- Automobile travel
- Bus travel
- Rail travel
- Air travel
- Other modes of transportation

Companies may include emissions from teleworking (i.e., employees working remotely) in this category.

A reporting company's scope 3 emissions from employee commuting include the scope 1 and scope 2 emissions of employees and third-party transportation providers.

Even though employee commuting is not always purchased or reimbursed by the reporting company, it is categorized as an upstream scope 3 category because it is a service that enables company operations, similar to purchased or acquired goods and services.

Calculating Emissions from Employee Commuting

Calculating emissions from employee commuting involves multiplying activity data (i.e., passenger kilometers travelled by mode of transport) by emission factors (typically default national emission factors by mode of transport). Modes of transport include rail, subway, bus, automobile, bicycle, walking, etc.

Option 1: Company-Specific Method

Activity Data Needed

Companies should collect data on the following:

- Total distance travelled by employees over the reporting period
- Mode of transport used for commuting (e.g., train, subway, bus, car, bicycle, etc.)

Emission Factors Needed

Companies should collect:

- Emission factors for each mode of transport (usually expressed as kg GHG emitted per passenger-kilometer travelled)

Note: For air travel emission factors, multipliers or other corrections to account for radiative forcing may be applied to the GWP of emissions arising from aircraft transport. Where used, companies should disclose the specific factor used.

Data Collection Guidance

Companies should collect data on employee commuting habits, for example through a survey. Companies should survey their employees annually to obtain information on average commuting habits. Types of data to collect include:

- Distance travelled by employees per day, or location of residence and office
- The number of days per week that employees using different vehicle types (e.g., all categories of subway, car, bus, train, bicycle, etc.)

[3] "Employees" refers to employees of entities and facilities owned, operated, or leased by the reporting company. Companies may include employees of other relevant entities (e.g., franchises or outsourced operations) in this category, as well as consultants, contractors, and other individuals who are not employees of the company, but commute to facilities owned and operated by the company.

- Number of commuting days per week and number of weeks worked per year
- If the company is multinational: employees' region of residence/work (since transportation emission factors vary by region)
- If applicable, the amount of energy used from teleworking (e.g., kWh of gas, electricity consumed)

Collecting commuting data from all employees through a survey may not be feasible. In such a case, companies may extrapolate from a representative sample of employees to represent the total commuting patterns of all employees. For example, a company may have 4,000 employees, who each have different commuting profiles. In such cases, companies may extrapolate from a representative sample of 1000 employees to approximate the total commuting of all employees. See section 0.4 for more information.

Calculation Formula - Employee Commuting, Company-Specific Method

Companies should convert daily commuting distance into annual commuting distance by multiplying the daily distance by the number of times the trip occurs during the reporting period. For example, if a company collects distance data on one-way journeys, the company should multiply the distance by the number of working days in the reporting year, and then multiply by two to take into account return journeys each day.

Distance travelled data by transport mode should be summed across all employees to obtain total annual kilometers or passenger-kilometers travelled by each mode of transport.

Companies then should apply the formula below to calculate emissions.

Calculating CO_2e emissions for employee travel

First, sum across all employees to determine total distance travelled using each vehicle type:

$$Total\ distance\ traveled\ by\ vehicle\ type\ (vehicle-km\ or\ passenger-km) = \sum(daily\ one\ way\ distance\ between\ home\ and\ work\ (km) \times 2 \times number\ of\ commuting\ days\ per\ year)$$

Then, sum across vehicle types to determine total emissions

$$kg\ CO2(e) from\ Employee\ Commuting = \sum Total\ distance\ travelled\ by\ vehicle\ type\ (vehicle-km\ or\ passenger-km) \times vehicle\ specific\ emission\ factor\ (kg\ CO2e/vehicle-km\ or\ kg\ CO2e/passenger-km)$$

+

(Optionally) For each energy source used in teleworking:

$$\sum Quantities\ of\ energy\ consumed\ (kWh) \times emission\ factor\ for\ energy\ source\ (kg\ CO2e/kWh)$$

Example:

Company A is a small advertising services company, with 3 employees working 48 weeks per year. In order to calculate emissions from employee commuting it creates an "employee commuting profile" for each employee. Each employee completes a questionnaire, with the results summarized in the following table:

Employee	Rail Commute (times per week)	One way distance by rail (km)	Rail emission factor (kg CO_2e/passenger-kilometer)	Car Commute (times per week	Car emission factor (kg CO_2e/vehicle-kilometer)	One way distance by car (km)
A	5	10	0.1	0	0.2	N/A
B	4	10	0.1	1	0.2	15
C	0	N/A	0.1	5	0.2	20

Note: The activity data and emissions factors are illustrative only, and do not refer to actual data.

The total distance travelled by rail (km) is calculated as:
$\sum(daily\ one\ way\ distance\ between\ home\ and\ work\ (km) \times 2 \times number\ of\ commuting\ days\ per\ year)$
$= (10 \times 2 \times 5 \times 48) + (10 \times 2 \times 4 \times 48)$
$= 8{,}640\ km$

The total distance travelled by car (km) is calculated as:
$\sum(daily\ one\ way\ distance\ between\ home\ and\ work\ (km) \times 2 \times number\ of\ commuting\ days\ per\ year)$
$= (15 \times 2 \times 1 \times 48) + (20 \times 2 \times 5 \times 48)$
$= 11{,}040\ km$

Total emissions from employee commuting for the reporting year is calculated as:
$\sum Total\ distance\ travelled\ by\ vehicle\ type\ (vehicle - km\ or\ passenger - km) \times vehicle\ specific\ emission\ factor\ (kg\ CO2e/vehicle - km\ or\ kg\ CO2e/passenger - km)$
$= (8{,}640 \times 0.1) + (11{,}040 \times 0.2)$
$= 3{,}072\ kg\ CO2e$

Option 2: Average-Data Method

If company specific data is unavailable, companies may use average secondary activity data to estimate distance travelled and mode of transport. This may include using:

- Average daily commuting distances of typical employees
- Average modes of transport of typical employees
- Average number of commuting days per week and average number of weeks worked per year

Such estimation requires making several simplifying assumptions, which add uncertainty to the emissions estimates.

Activity Data Needed

Companies should collect data on:

- Number of employees
- Average distance travelled by an average employees per day
- Average breakdown of transport modes used by employees
- Average number working days per year

Emission Factors Needed

Companies should collect:

- Emission factors for each mode of transport (usually expressed as kg GHG emitted per passenger-kilometer travelled)

Data Collection Guidance

Company may collect average secondary data from sources such as national transportation departments, ministries or agencies, national statistics publications, and/or industry associations.

For example, the UK Office for National Statistics publishes average commuting patterns and distances (http://www.neighbourhood.statistics.gov.uk/dissemination/Info.do?page=analysisandguidance/commutingstatistics/commuting-statistics.htm).

Calculation Formula - Employee Commuting, Average-Data Method

Companies should convert average daily commuting distance into annual average commuting distance by multiplying the one-way distance by two for the daily return trip and by the average number of days worked per year (i.e., excluding weekends and days spent on business travel, vacation, working from home, etc).

To calculate emissions, use the following formula:

CO_2e emissions from employee commuting=
Sum across each transport mode:

$$\sum Total\ number\ of\ employees \times \%\ of\ employees\ using\ mode\ of\ transport \times one\ way\ commuting\ distance\ \ (vehicle - km\ or\ passenger - km) \times 2 \times working\ days\ per\ year \times emission\ factor\ of\ transport\ mode\ \ (kg\ CO2e/vehicle - km\ or\ kg\ CO2e/passenger - km)$$

Calculation Resources:

- GHG Protocol Calculation Tool, "CO_2 Emissions from Employee Commuting. Version 2.0. June 2006" Developed by World Resources Institute, available at http://www.ghgprotocol.org.
- GHG Protocol Calculation Tool, "Mobile Combustion GHG Emissions Calculation Tool. Version 2.0. June 2009" Developed by World Resources Institute, available at http://www.ghgprotocol.org.
- US EPA Climate Leaders GHG Inventory Protocol, "Optional Emissions from Commuting, Business Travel and Product Transport," available at: http://www.epa.gov/stateply/documents/resources/commute_travel_product.pdf

Example:

Company A is a manufacturer in the UK with over 10,000 employees. To determine the distance and mode of transport of employee travel it refers to the UK Department of Transport, which released information regarding average commute choices and distances of commuters. Using national statistics, it is determined that UK workers work on average 230 days a year. It's assumed that employees do not car share. The results of the study are as below:

Commute Group	% of total commutes	Average one way distance (km)	Emission factor (kg CO_2e/vehicle or passenger km
Rail	50%	10	0.1
Car	30%	15	0.2
Foot	15%	1	0
Bus	5%	5	0.1

Note: The activity data and emissions factors are illustrative only, and do not refer to actual data.

CO_2e emissions by mode of transport can be calculated as follows:

Emissions from employee commuting=

$$\sum Total\ number\ of\ employees \times \%\ of\ employees\ using\ mode\ of\ transport \times one\ way\ commuting\ distance\ \ (vehicle - km\ or\ passenger - km) \times 2 \times working\ days\ per\ year \times emission\ factor\ of\ transport\ mode\ \ (kg\ CO2e/vehicle - km\ or\ kg\ CO2e/passenger - km)$$

Rail Commuters:

$$= (10{,}000 \times 50\% \times 10 \times 2 \times 235 \times 0.1)$$
$$= 2{,}350{,}000\ kg\ CO2e$$

Car Commuters:

$$= (10{,}000 \times 30\% \times 15 \times 2 \times 235 \times 0.2)$$
$$= 4{,}230{,}000\ kg\ CO2e$$

Foot Commuters:

$$= (10{,}000 \times 15\% \times 1 \times 2 \times 235 \times 0)$$
$$= 0\ kg\ CO2e$$

Bus Commuters:

$$= (10{,}000 \times 5\% \times 5 \times 2 \times 235 \times 0.1)$$
$$= 117{,}500\ kg\ CO2e$$

Total CO_2e of employee travel can be calculated as follows:

$$= 2{,}350{,}000 + 4{,}230{,}000 + 0 + 117{,}500$$
$$= 6{,}697{,}500 kg\ CO2e$$

Summary of Calculation Methods for Category 7 (Employee commuting)

Method	Calculation Formula	Activity Data Needed	Emission Factor Needed
1.Company-Specific Method	First, sum across all employees to determine total distance travelled using each vehicle type: $Total\ distance\ traveled\ by\ vehicle\ type\ (vehicle-km\ or\ passenger-km) = \sum(daily\ one\ way\ distance\ between\ home\ and\ work\ (km) \times 2 \times number\ of\ commuting\ days\ per\ year)$ Then, sum across vehicle types to determine total emissions $kg\ CO2(e) from\ Employee\ Commuting = \sum Total\ distance\ travelled\ by\ vehicle\ type\ (vehicle-km\ or\ passenger-km) \times vehicle\ specific\ emission\ factor\ (kg\ CO2e/vehicle-km\ or\ kg\ CO2e/passenger-km)$ + (Optionally) For each energy source used in teleworking: $\sum Quantities\ of\ energy\ consumed\ (kWh) \times emission\ factor\ for\ energy\ source\ (kg\ CO2e/kWh)$	• Total distance travelled by employees over the reporting period • Mode of transport used for commuting (e.g., train, subway, bus, car, bicycle, etc.)	Emission factors for each mode of transport (usually expressed as kg GHG emitted per passenger-kilometer travelled)
2.Average-Data Method	Sum across each transport mode: $\sum Total\ number\ of\ employees \times \%\ of\ employees\ using\ mode\ of\ transport \times one\ way\ commuting\ distance\ (vehicle-km\ or\ passenger-km) \times 2 \times working\ days\ per\ year \times emission\ factor\ of\ transport\ mode\ (kg\ CO2e/vehicle-km\ or\ kg\ CO2e/passenger-km)$	• Number of employees • Average distance travelled by an average employees per day • Average breakdown of transport modes used by employees • Average number working days per year	Emission factors for each mode of transport (usually expressed as kg GHG emitted per passenger-kilometer travelled)

Category 8: Upstream Leased Assets (Not Included in Scope 1 or 2)

Category Description

This category includes emissions from the operation of assets that are leased by the reporting company in the reporting year and not already included in the reporting company's scope 1 or scope 2 inventories. This category is only applicable to companies that operate leased assets (i.e., lessees). For companies that own and lease assets to others (i.e., lessors), see category 13 (Downstream leased assets).

Leased assets may be included in a company's scope 1 or scope 2 inventory depending on the type of lease and the consolidation approach the company uses to define its organizational boundaries.

If the reporting company leases an asset for only part of the reporting year, it should account for emissions for the portion of the year that the asset was leased. A reporting company's scope 3 emissions from upstream leased assets include the scope 1 and scope 2 emissions of lessors (depending on the lessor's consolidation approach).

Calculating Emissions from Leased Assets

Companies may use either of two methods to calculate emissions from leased assets:

- **Site-Specific Method**, which involves collecting site-specific fuel and energy data from individual leased assets, or the
- **Average-Data Method**, which involves estimating emissions for each leased asset, or groups of leased assets, based on average data, such as average emissions per asset type or floor space.

Option 1: Site-Specific Method

This method involves collecting site-specific fuel and energy data from individual leased assets.

Activity Data Needed

Companies should collect data on:

- Site-specific fuel, electricity use; and
- Site-specific refrigerant leakage

Emission Factors Needed

Companies should collect:

- Site or regionally specific emission factors for energy sources (e.g. electricity and fuels) per unit of consumption (e.g. kg CO_2e/kWh for electricity, kg CO_2e/liter for diesel); and
- Emission factors of fugitive and process emissions

Data Collection Guidance

Data sources for activity data may include:

- Utility bills
- Purchase records
- Meter readings
- Internal IT systems

Data sources for emission factors include:

- The GHG Protocol Website (www.ghgprotocol.org)
- Life cycle databases
- Company developed emission factors
- Industry associations

Calculation Formula - Upstream Leased Assets, Site-Specific Method

To calculate scope 3 emissions from leased assets, aggregate the scope 1 and scope 2 emissions across all of the reporting company's leased assets, using this formula:

Reporting Company's Scope 3 Emissions from Leased Assets (Upstream) =
Sum Across Leased Assets $$\sum Scope\ 1\ and\ 2\ Emissions\ of\ Each\ Leased\ Asset$$

Companies that lease a portion of a building (e.g., an office building) where energy use is not separately sub-metered by tenant may estimate energy consumed using the reporting company's share of the building's total floor space and total building energy use, following this formula:

$$\text{Energy use from Leased Space (kWh)} = \frac{\text{Reporting Company's Area (m}^2\text{)}}{\text{Building's Total Area (m}^2\text{)}} \times \frac{\text{Building's Total Energy Use}}{\text{Building's Occupancy Rate (e.g., 0.75)}}$$

Option 2: Average-Data Method

The Average data approach involves estimating emissions for each leased asset, or groups of leased assets, based on average statistics and secondary data, such as average emissions per asset type or floor space. The Average data approach should be used when purchase records, electricity bills, or meter readings of fuel or energy use are not available or applicable. Approaches include:

- Estimated emissions based on occupied floor space by asset/building type
- Estimated emissions based on number and type of leased assets

Note that the Average data approach may be relatively inaccurate and limits the ability of companies to track performance of GHG reduction actions.

Activity Data Needed

Companies should collect data on:

- Floor space of each leased asset
- Number of leased assets, by building type; and/or
- Number of leased assets that give rise to Scope 2 emissions (e.g. company cars, trucks, etc).

Emission Factors Needed

Companies should collect:

- Average emission factors by floor space, expressed in units of emissions per square meter, square foot occupied (e.g. kg CO2e/m2/year);
- Average emission factors by building type, expressed in units of emissions per building (e.g. kg CO2e/small office block/year)
- Emission factors by asset type, expressed in units of emissions per asset (e.g. kg CO2e/car/year)

Calculation Formula - Upstream Leased Assets, Average-Data Method

For commercial assets (office, warehouse, retail) where office space data is available:

Reporting Company' s Scope 3 Emissions from Commercial Assets (Upstream)=
Sum across each building type: $$\sum Floor\ Space\ (m2) \times\ Average\ Emission\ Factor\ ((kg\ CO2e)/m2/year)$$

If floor space data is not available:

Reporting Company' s Scope 3 Emissions from Other Assets (Upstream)=
Sum across each asset type: $$\sum Building/Asset\ Type \times\ Average\ Emissions\ Per\ Building/Asset\ Type\ (kg\ CO2e/Asset\ type/year)$$

Calculation Resources

- The U.S. Energy information Administration has developed a dataset on average energy use by building type. Commercial Buildings Energy Consumption Survey, at http://www.eia.doe.gov/emeu/cbecs

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

Method	Calculation Formula	Activity Data Needed	Emission Factor Needed
1.Site-Specific Method	Sum Across Leased Assets $\sum Scope\ 1\ and\ 2\ Emissions\ of\ Each\ Leased\ Asset$ Energy use from Leased Space (kWh) = $\frac{\text{Reporting Company's Area } (m^2)}{\text{Building's Total Area } (m^2)} \times \frac{\text{Building's Total Energy Use}}{\text{Building's Occupancy Rate (e.g., 0.75)}}$	• Site-specific fuel, electricity use; and • Site-specific refrigerant leakage •	• Site or regionally specific emission factors for energy sources (e.g. electricity and fuels) per unit of consumption (e.g. kg CO_2e/kWh for electricity, kg CO_2e/liter for diesel); and • Emission factors of fugitive and process emissions •
2.Average-Data Method	Reporting Company' s Scope 3 Emissions from Commercial Assets (Upstream)= Sum across each building type: $\sum Floor\ Space\ (m2) \times\ Average\ Emission\ Factor\ ((kg\ CO2e)/m2/year)$ Reporting Company' s Scope 3 Emissions from Other Assets (Upstream)= Sum across each asset type: $\sum Building/Asset\ Type \times\ Average\ Emissions\ Per\ Building/Asset\ Type\ (kg\ CO2e/Asset\ type/year)$	• Floor space of each leased asset • Number of leased assets, by building type; and/or • Number of leased assets that give rise to Scope 2 emissions (e.g. company cars, trucks, etc).	• Average emission factors by floor space, expressed in units of emissions per square meter, square foot occupied (e.g. kg CO2e/m2/year); • Average emission factors by building type, expressed in units of emissions per building (e.g. kg CO2e/small office block/year) • Emission factors by asset type, expressed in units of emissions per asset (e.g. kg CO2e/car/year)

Category 9: Downstream Transportation and Distribution

Category Description

This category includes emissions from 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), in vehicles and facilities not owned or controlled by the reporting company. This category includes emissions from retail and storage. Outbound transportation and distribution services that are purchased by the reporting company are excluded from category 9 and included in category 4 (Upstream transportation and distribution) because the reporting company purchases the service. Category 9 only includes transportation- and distribution-related emissions that occur after the reporting company pays to produce and distribute its products. See table 5.7 for guidance on accounting for emissions from transportation and distribution in the value chain.

Emissions from downstream transportation and distribution can arise from:

- Storage of sold products in warehouses and distribution centers
- Storage of sold products in retail facilities
- Air transport
- Rail transport
- Road transport
- Marine transport

Companies may include emissions from customers traveling to retail stores in this category, which can be significant for companies that own or operate retail facilities. See section 5.6 for guidance on the applicability of category 9 to final products and intermediate products sold by the reporting company. A reporting company's scope 3 emissions from downstream transportation and distribution include the scope 1 and scope 2 emissions of transportation companies, distribution companies, retailers, and (optionally) customers.

Calculating Emissions from Transportation (Downstream)

The emissions from downstream transportation and distribution should follow the same calculation methods as set out in Category 4.

The major difference between calculating upstream and downstream emissions of transportation is likely to be the availability and quality of activity data. Transportation data is likely to be easier to obtain from upstream suppliers than downstream purchasers and transportation companies. This is because upstream suppliers often have economic interests to co-operate with the reporting company.

For the above reasons, it is more likely that Calculation Method Option 2: Distance-Based Method will be used by the reporting company. When collecting data on transportation distance, since actual distances from purchasers are not likely to be known, the reporting company may estimate downstream distances by a combination of:

- Government, academic, or industry publications;
- Online maps and calculators; and/or
- Published port-to-port travel distances

For example, the UK government produces average freight distances for main categories of goods in the economy (see http://www.dft.gov.uk/pgr/statistics/datatablespublications/freight/). This may be used in the absence of purchaser specific data.

Example

Company A sells timber to furniture Company B, which manufactures the timber into furniture and retails them. Company A collects information on the mass of timber sold to Company B and estimates the downstream transport distances of the following:

- From point of sale to Company B
- From Company B's manufacturing facility to retail distribution centers; and
- From retail distribution centers to retail outlets.

The data is summarised in the table below:

Purchaser	Mass of Goods Sold (tonnes)	Total Downstream Distance Transported (km)	Transport Mode or Vehicle Type	Emission Factor (kg CO_2e/tonne-km)
B	4	2,000	Truck (rigid, >3.5-7.5t)	0.2

Note: the activity data and emissions factors are illustrative only, and do not refer to actual data.

Emissions from downstream transport:

$$\sum (Quantity\ of\ goods\ sold\ (tonnes) \times Distance\ travelled\ in\ transport\ legs\ (km) \times emission\ factor\ of\ transport\ mode\ or\ vehicle\ type\ (kg\ CO2e/tonne-km))$$
$$= 4 \times 2{,}000 \times 0.2$$
$$= 1{,}600\ kg\ CO2e$$

Calculating Emissions from Distribution (Downstream)

For the same reasons outlined above, the reporting company is more likely to apply the Average-Data Method. The calculation methods do not differ between upstream and downstream distribution.

Category 10: Processing of Sold Products

Category Description

This category includes emissions from processing of sold intermediate products by third parties (e.g., manufacturers) subsequent to sale by the reporting company. Intermediate products are products that require further processing, transformation, or inclusion in another product before use (see box 5.5), and therefore result in emissions from processing subsequent to sale by the reporting company and before use by the end consumer. Emissions from processing should be allocated to the intermediate product.

In certain cases, the eventual end use of sold intermediate products may be unknown. For example, a company may produce an intermediate product with many potential downstream applications, each of which has a different GHG emissions profile, and be unable to reasonably estimate the downstream emissions associated with the various end uses of the intermediate product. See section 6.4 for guidance in cases where downstream emissions associated with sold intermediate products are unknown.

Companies may calculate emissions from category 10 without collecting data from customers or other value chain partners. For more information, see *Guidance for Calculating Scope 3 Emissions*, available online at www.ghgprotocol.org. See also section 5.6 for guidance on the applicability of category 10 to final products and intermediate products sold by the reporting company. A reporting company's scope 3 emissions from processing of sold intermediate products include the scope 1 and scope 2 emissions of downstream value chain partners (e.g., manufacturers).

Calculating Emissions from Processing of Sold Products

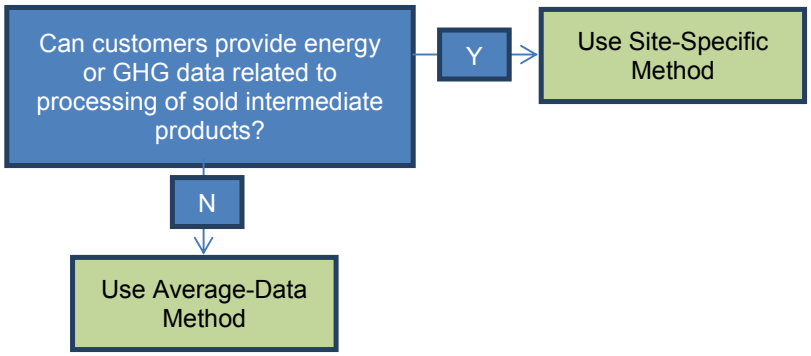
Companies may use either of two methods to calculate scope 3 emissions from processing of sold products:

- **Site-Specific Method**: involves determining the amount of fuel, electricity and waste incurred from processing of sold intermediate products by the third party and applying the appropriate emissions factors.

- **Average-Data Method**: involves estimating emissions for processing of sold intermediate products based on average secondary data, such as average emissions per process or per product.

Companies should choose a Calculation Method based on their business goals and their ability to collect data from processing of sold intermediate products by third parties. In many cases, collecting primary data from downstream value chain partners may be difficult. In such cases, companies should use the Average-Data Method approach.

Figure 1. Decision Tree for selecting a Calculation Method



Option 1: Site-Specific Method

To calculate emissions from the processing of sold products by third parties, companies should collect either of the following types of data from downstream value chain partners:

- Relevant activity data (e.g., fuel use, electricity use, and waste) and relevant emission factors for each downstream process, or

- GHG emissions data for each downstream process calculated by downstream value chain partners.

If downstream processes involve intermediate goods and/or material inputs other than those sold by the reporting company, emissions should be allocated between intermediate product(s) sold by the reporting company and other intermediate products/material inputs. For examples of allocating emissions, refer to Chapter 8 ("Allocating Emissions") of the *Scope 3 Standard*.

If data cannot be obtained from downstream third party partners, then the Average-Data Method should be used.

Emissions from processing should be allocated to the intermediate product.

Activity Data Needed

Companies should first collect data on the types and quantities of intermediate goods sold by the reporting company.

Companies should then collect either site-specific GHG emissions data provided by downstream value chain partners, or site-specific activity data from downstream processes, including:

- Quantities of energy (including electricity and fuels) consumed in process(es)
- To the extent possible, mass of waste generated in process(es); and
- If applicable, activity data related to non-combustion emissions (i.e., industrial process or fugitive emissions)

Emission Factors Needed

If site-specific activity data is collected, companies should also collect:

- Emission factors for fuels
- Emission factors for electricity
- To the extent possible, emission factors for waste outputs; and
- If applicable, emission factors related to non-combustion emissions (i.e., industrial process or fugitive emissions)

Data Collection Guidance

Companies should collect data on the types and mass of intermediate goods sold by the reporting company from internal records.

Companies should request either GHG emissions data or activity data from downstream processes from the downstream value chain partners that control those processes. Downstream partners can obtain this data from, for example:

- Internal IT systems
- Utility bills
- Purchase receipts; and/or
- Meter readings

Data sources for emission factors include:

- The GHG Protocol website (www.ghgprotocol.org)
- Company or manufacturer developed emission factors
- Industry associations

Calculation Formula - Processing of Sold Products, Site-Specific Method:

Calculating CO_2e emissions for processing of sold intermediate products =
Sum across fuel consumed in the processing of sold intermediate products: $\sum Quantity\ of\ fuel\ consumed\ (e.g., litre) \times emission\ factor\ for\ fuel\ source\ (e.g., kg\ CO2e/litre)$ + Sum across electricity consumed in the processing of sold intermediate products: $\sum Quantity\ of\ electricity\ consumed\ (e.g., kWh)$ $\times emission\ factor\ for\ electricity\ (e.g., kg\ CO2e/kWh)$ +

Sum across refrigerants used in the processing of sold intermediate products:
$\sum Quantity\ of\ refrigerant\ leakage\ (kg)\ \times\ emission\ factor\ for\ refrigerant\ (kg\ CO2e/kg)$
+
To the extent possible, sum across waste generated in the in the processing of sold intermediate products:
$\sum Mass\ of\ waste\ output\ (kg) \times emission\ factor\ for\ waste\ activity\ (kg\ CO2e/kg)$

Calculation Resources

- GHG Protocol Calculation Tool, "Stationary Combustion GHG Emissions Calculation Tool. Version 2.0. June 2009" Developed by World Resources Institute, available at http://www.ghgprotocol.org.
- DEFRA GHG Conversion Factors, developed by the United Kingdom Department of Environment, Food and Rural Affairs (DEFRA), available at www.defra.gov.uk/environment/business/reporting/conversion-factors.htm

Example

Company A is a company that produces plastic resin and is an exclusive supplier to Company B, who produces plastic handles for consumer goods. Company A collects information from Company B regarding the fuel, electricity used and waste outputs of processing the resin into handles. The information is summarised in the tables below:

Fuel and Electricity Consumed	Amount (kWh)	Emission Factor (kg CO_2e/kWh)
Natural Gas	3,500	0.2
Electricity	2,000	0.5

Waste	Amount (kg)	Emission Factor (kg CO_2e/kg waste)
Waste products	50	0.5

Note: The activity data and emissions factors are illustrative only, and do not refer to actual data.

Emissions are calculated by multiplying activity data by respective emission factors, as follows:

Emissions from fuel consumed:
$\sum Quantity\ of\ fuel\ consumed\ (e.g., litre) \times emission\ factor\ for\ fuel\ source\ (e.g., kg\ CO2e/litre)$
$= 3{,}500 \times 0.2$
$= 700\ kg\ CO2(e)$

Emissions from electricity consumed:
$\sum Quantity\ of\ electricity\ consumed\ (e.g., kWh) \times emission\ factor\ for\ electricity\ (e.g., kg\ CO2e/kWh)$
$= 2000 \times 0.5$
$= 1{,}000\ kg\ CO2(e)$

Waste output by Supplier B:
$\sum Mass\ of\ waste\ output\ (kg) \times emission\ factor\ for\ waste\ activity\ (kg\ CO2e/kg)$
$= 50 \times 0.5$
$= 25\ kg\ CO2(e)$

Total emissions from processing of sold intermediate products:
$= emissions\ from\ fuel\ +\ emissions\ from\ electricity\ +\ emissions\ from\ waste$
$= 700 + 1{,}000 + 25$
$= 1{,}725\ kg\ CO2(e)$

Option 2: Average-Data Method

In this method, companies collect data on the type of downstream process(es) involved in transforming or processing sold intermediate products into final products and apply relevant industry average emission factors to determine emissions. The method should be used when it is not possible to collect data from downstream value chain partners.

If the downstream processes use multiple types of inputs, then companies should allocate emissions to the intermediate product sold by the reporting company. See Chapter 8 of the *Scope 3 Standard* for guidance on allocation.

Emissions from processing should be allocated to the intermediate product.

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 an usable state final product, subsequent to sale by the reporting company;
- Information needed for allocation (e.g. mass, economic value etc)

Emission Factors Needed

Companies should collect either:

- Average emission factors for downstream processes to transform the sold intermediate product, expressed in units of emissions (e.g., CO_2, CH_4, N_2O) per unit of product (e.g. kg CO_2/kg of final product)

Or:

- Life cycle emission factors of sold products
- Life cycle emission factors of final products

Data Collection Guidance

Data sources for activity data include:

- Purchasing records
- Internal data systems; and/or
- Industry-averages from associations or databases

Data sources for emission factors include:

- Life cycle databases
- The GHG Protocol website (www.ghgprotocol.org);
- Companies or manufacturers
- Industry associations

Calculation Formula - Processing of Sold Products, Average-Data Method

Calculating CO_2e emissions for processing of sold intermediate products =
Sum across intermediate products $\sum(Mass\ of\ \ sold\ intermediate\ product\ (kg)$ $\times\ emission\ factor\ of\ processing\ of\ sold\ products\ (\ kg\ CO2e/kg\ of\ final\ product)$

Example

Company E is a producer of sugar and an exclusive supplier to Company F which makes candy. Company F confirms with Company E that after sugar is purchased, there are further processes before the final candy product is produced. Company E collects industry average emission factors for the processes. The information is summarised in the table below:

Process	Mass of sold intermediate product (kg)	Emission factor of downstream process (kg CO_2e/kg)
Candy mixing, cooking, moulding, cooling, wrapping and packaging	1,000	1.5

Note: the activity data and emissions factors are illustrative only, and do not refer to actual data.

Emissions from candy mixing and cooking process:

$$\sum(Mass\ of\ \ sold\ intermediate\ product$$
$$\times\ emission\ factor\ of\ downstream\ processes\ (\ kg\ CO2e/kg\ of\ final\ product)$$

$$= 1{,}000 \times 1.5$$
$$= 1500\ kg\ CO2(e)$$

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

Method	Calculation Formula	Activity Data Needed	Emission Factor Needed
1.Site-Specific Method	Sum across fuel consumed in the processing of sold intermediate products: $\sum Quantity\ of\ fuel\ consumed\ (e.g., litre)$ $\times\ emission\ factor\ for\ fuel\ source\ (e.g., kg\ CO2e/litre)$ + Sum across electricity consumed in the processing of sold intermediate products: $\sum Quantity\ of\ electricity\ consumed\ (e.g., kWh)$ $\times\ emission\ factor\ for\ electricity\ (e.g., kg\ CO2e/kWh)$ + Sum across refrigerants used in the processing of sold intermediate products: $\sum Quantity\ of\ refrigerant\ leakage\ (kg)$ $\times\ emission\ factor\ for\ refrigerant\ (kg\ CO2e/kg)$ + To the extent possible, sum across waste generated in the in the processing of sold intermediate products: $\sum Mass\ of\ waste\ output\ (kg) \times emission\ factor\ for\ waste\ activity\ (kg\ CO2e/kg)$	Companies should then collect either site-specific GHG emissions data provided by downstream value chain partners, or site-specific activity data from downstream processes, including: • Quantities of energy (including electricity and fuels) consumed in process(es) • To the extent possible, mass of waste generated in process(es); and • If applicable, activity data related to non-combustion emissions (i.e., industrial process or fugitive emissions)	• If site-specific activity data is collected, companies should also collect: • Emission factors for fuels • Emission factors for electricity • To the extent possible, emission factors for waste outputs; and • If applicable, emission factors related to non-combustion emissions (i.e., industrial process or fugitive emissions)
2.Average-Data Method	Sum across intermediate products $\sum(Mass\ of\ sold\ intermediate\ product\ (kg)$ $\times\ emission\ factor\ of\ processing\ of\ sold\ products\ (kg\ CO2e$ $/kg\ of\ final\ product)$	• For each type of sold intermediate product, companies should collect data on: • The process(es) involved in transforming or processing sold intermediate products into an usable state final product, subsequent to sale by the reporting company; • Information needed for allocation (e.g. mass, economic value etc)	• Companies should collect either: • Average emission factors for downstream processes to transform the sold intermediate product, expressed in units of emissions (e.g., CO2, CH4, N2O) per unit of product (e.g. kg CO2/kg of final product) Or: • Life cycle emission factors of sold products • Life cycle emission factors of final products

Category 11. Use of Sold Products

Category Description

This category includes emissions from the use of goods and services sold by the reporting company in the reporting year by end users. A reporting company's scope 3 emissions from use of sold products include the scope 1 and scope 2 emissions of end users. End users include both consumers and business customers that use final products.

This category includes the total expected lifetime emissions from all relevant products sold in the reporting year. By doing so, the scope 3 inventory accounts for a company's total GHG impact associated with its activities in the reporting year. See section 5.4 for more information on the time boundary of scope 3 categories, including category 11. See box 5.9 for guidance related to product lifetime and durability and box 5.10 for an example of reporting product lifetime emissions.

This standard divides emissions from the use of sold products into two types:

- Direct use-phase emissions
- Indirect use-phase emissions

The minimum boundary of category 11 includes direct use-phase emissions of sold products. Companies may also account for indirect use-phase emissions of sold products, and should do so when indirect use-phase emissions are expected to be significant.

See table 5.8 for descriptions and examples of direct and indirect use-phase emissions.

Table 5.8. Emissions from use of sold products

Type of Emissions	Product Type	Examples
Direct use-phase emissions (*Required*)	Products that directly consume energy (fuels or electricity) during use	Automobiles, aircraft, engines, motors, power plants, buildings, appliances, electronics, lighting, data centers, web-based software
	Fuels and feedstocks	Petroleum products, natural gas, coal, biofuels, and crude oil
	Greenhouse gases and products that contain or form greenhouse gases that are emitted during use	CO_2, CH_4, N_2O, HFCs, PFCs, SF_6, refrigeration and air-conditioning equipment, industrial gases, fire extinguishers, fertilizers
Indirect use-phase emissions (*Optional*)	Products that indirectly consume energy (fuels or electricity) during use	Apparel (requires washing and drying), food (requires cooking and refrigeration), pots and pans (require heating), and soaps and detergents (require heated water)

Companies may optionally include emissions associated with maintenance of sold products during use.

Companies may calculate emissions from category 11 without collecting data from customers or consumers. Calculating emissions from category 11 typically requires product design specifications and assumptions about how consumers use products (e.g., use profiles, assumed product lifetimes, etc.) Companies are required to report a description of the methodologies and assumptions used to calculate emissions (see chapter 11).

Where relevant, companies should report additional information on product performance when reporting scope 3 emissions in order to provide additional transparency on steps companies are taking to reduce GHG emissions from sold products. Such information may include GHG intensity metrics, energy

intensity metrics, and annual emissions from the use of sold products (see section 11.3). See section 9.3 for guidance on recalculating base year emissions when methodologies or assumptions related to category 11 change over time.

Any claims of avoided emissions related to a company's sold products must be reported separately from the company's scope 1, scope 2, and scope 3 inventories. (For more information, see section 9.5.)

Box 5.9. Product lifetime and durability

Because the scope 3 inventory accounts for total lifetime emissions of sold products, companies that produce more durable products with longer lifetimes could appear to be penalized because, as product lifetimes increase, scope 3 emissions increase, assuming all else is constant. To reduce the potential for emissions data to be misinterpreted, companies should also report relevant information such as product lifetimes and emissions intensity metrics to demonstrate product performance over time. Relevant emissions intensity metrics may include annual emissions per product, energy efficiency per product, emissions per hour of use, emissions per kilometer driven, emissions per functional unit, etc.

Box 5.10. Example of reporting product lifetime emissions

An automaker sells one million cars in 2010. Each car has an expected lifetime of ten years. The company reports the anticipated use-phase emissions of the one million cars it sold in 2010 over their ten year expected lifetime. The company also reports corporate average fuel economy (km per liter) and corporate average emissions (kg CO_2e/km) as relevant emissions-intensity metrics.

This section provides guidance of the following:

- What should be included in the emissions from use of sold products
- Guidance on what to include in a use profile
- Reporting guidance
- Guidance on how to assess uncertainty on the product's use profile

Calculating Emissions from Use of Sold Products

This guidance provides calculation methods to calculate a company's:

- Direct use phase emissions
- Indirect use phase emissions

Calculation Methods for Direct Use Phase Emissions

Companies should first determine which categories their products belong in:

- **Energy Using Products**: involves breaking down the use phase, measuring emissions per product and aggregating emissions.

- **Fuel or Feedstock**: involves collecting fuel use data and multiplying them by representative fuel emission factors.

- **Products where GHGs are emitted during use:** involves collecting data on the GHG contained in product and multiplying them by the % of GHGs released and GHG emission factors.

Where companies sell a large selection of products it may be practical for a lower level of granularity to be used when measuring the use phase of a product. Where this is the case products may be grouped by similar characteristics and assigned an average use phase.

Calculation Methods for Direct Use Phase Emissions – Energy Using Products

Lifetime-Uses Method

In this method, the company multiplies the lifetime number of uses of each product by the amount sold and an emission factor per use. Companies should then aggregate use phase emissions of all products.

Where the use phase of a product is likely to be similar between multiple products companies may choose to group similar products and use average statistics for a typical product in the product group. For example, a fast moving consumer goods company selling carbonated drinks may decide to group by packaging types and treat all products within that group with the same use-profile.

Activity Data Needed

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

Emission Factors Needed

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

Data Collection Guidance

Data sources for activity data include:

- Internal data systems
- Sales records
- Surveys
- Industry associations

Data sources for emission factors include:

- The GHG Protocol website (www.ghgprotocol.org)
- Lifecycle databases
- Company or supplier developed emission factors
- Industry associations

Calculation Formula - Use of Sold Products (Direct Use Phase), Energy Using Products, Lifetime-Uses Method

Emissions from use of sold products =

Sum across fuels consumed from use of products:

$$\sum Total\ lifetime\ expected\ uses\ of\ product \times Number\ sold\ in\ reporting\ period \times fuel\ consumed\ per\ use\ (kWh) \times Emission\ factor\ for\ fuel\ (kg\ CO2e/kWh))$$

+

Sum across electricity consumed from use of products:

$$\sum Total\ lifetime\ expected\ uses\ of\ product \times Number\ sold\ in\ reporting\ period \times electricity\ consumed\ per\ use\ (kWh) \times Emission\ factor\ for\ electricity(kg\ CO2e/kWh)$$

+

Sum across refrigerant leakage from use of products:

$$\sum Total\ lifetime\ expected\ uses\ of\ product \times Number\ sold\ in\ reporting\ period \times refrigerant\ leakage\ per\ use\ (kg) \times Emission\ factor\ for\ refrigerant(kg\ CO2e/kg)$$

Example

Company A is an electrical appliance manufacturer of washing machines and irons. It collects sales records of quantities sold as well as average lifetime uses for each of its products. It sources electricity emission factors per use from industry reports. The results are summarised in the table below:

Product	Total uses over lifetime	Number sold	Electricity Consumed per use (kWh)	Electricity Emission Factor (kg CO_2e/kWh)
Washing Machine X100	1,000	11,500	1.3	0.5
Washing Machine X200	1,100	1,900	1.5	0.5
Iron Y123	2,000	20,000	0.2	0.5

Note: The activity data and emissions factors are illustrative only, and do not refer to actual data.

Emissions for each product are calculated using the following formula:

$$\sum Total\ lifetime\ expected\ uses\ of\ product \times Number\ sold\ in\ reporting\ period \times electricity\ consumed\ per\ use\ (kWh) \times Emission\ factor\ for\ electricity(kg\ CO2e/kWh)$$

Washing Machine X100:
$= 1{,}000 \times 11{,}500 \times 1.3 \times 0.5$
$= 7{,}475{,}000\ kg\ CO2e$

Washing Machine X200:
$= 1{,}100 \times 1{,}900 \times 1.5 \times 0.5$
$= 1{,}567{,}500\ kg\ CO2e$

Iron Y123:
$= 2{,}000 \times 20{,}000 \times 0.2 \times 0.5$
$= 4{,}000{,}000\ kg\ CO2e$

Total emissions from use of sold products:
$= emissions\ from\ X100 + emissions\ from\ X200 + emissions\ from\ Y123$
=7,475,000 +1,567,500+ 4,000,000
$= 13{,}042{,}500\ kg\ CO2(e)$

Calculation Methods for Direct Use Phase Emissions – Fuels and Feedstocks

Combustion-Method

Where the reporting company is a producer of fuels and/or feedstocks, the use phase emissions are calculated by multiplying the quantities of fuels/feedstocks by combustion emission factors for the fuels/feedstocks.

Note that only the combustion emissions should be applied and not the scope 3 emissions to avoid double counting because the upstream emissions of the fuel were already included in Scope 1 and 2 and the previous scope 3 categories

Activity Data Needed

- Total quantities of fuels/feedstocks sold

Emission Factors Needed

- Combustion emission factors of fuel/feedstock

Data Collection Guidance

Combustion emission factors for fuel/feedstock are well documented in many internationally recognised sources such as the IPCC Fourth Assessment Report and the WRI/WBCSD GHG Protocol. In reality, the emissions will vary between applications and countries based on the following:

- **Technology**
  - For example the completeness of combustion may vary from application to application.
- **Exact fuel mix**
  - The precise fuel mix may vary from region to region and company to company, for example the types of aromatic hydrocarbon mixed with gasoline, may alter the combustion emissions.

Because of this variation companies should use the most representative emission factors for their fuel.

Calculation Formula - Use of Sold Products (Direct Use Phase), Fuel or Feedstocks, Combustion-Method

Emissions from fuel =
Sum across fuels/feedstocks $\sum Total\ quantity\ of\ fuel/feedstock\ sold\ (e.g.\ kWh) \times\ Combustion\ emission\ factor\ for\ fuel/feedstock (e.g.\ kg\ CO2e/kWh)$

Calculation Methods for Direct Use Phase Emissions – Product Containing GHGs that are Emitted During Use

Some products may contain GHGs which are emitted during use, or at the end of the useful life, such as products that contain refrigerents.

% GHG Released Method

Where the reporting company is a producer of products containing GHGs, use phase emissions is calculated by multiplying the quantities of products sold by the % of GHGs released per unit of GHG contained in the product and the Global Warming Potential (GWP) of the greenhouse gases released.

Activity Data Needed

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

Emission Factors Needed

- GWP of the GHGs contained in the product, expressed in units of carbon dioxide per unit kilogram of the GHG (e.g. 25 kg CO_2/kg)

Note: If different GHGs are released by the product, the total carbon dioxide equivalent should be reported and the breakdown of GHGs (e.g. CO_2, CH_4, N_2O) may be reported separately (see Chapter 8 of the scope 3 Standard).

Calculation Formula - Use of Sold Products (Direct Use Phase), Products where GHGs are emitted during use

The company should first account for all the different types of GHGs contained in a product, then aggregate for all products. Where the use phase of a product is likely to be similar between multiple products companies may choose to group similar products.

Emissions from products emitting GHGs during use =
Sum across GHGs released in a product or product group: $\sum(GHG\ contained\ per\ product \times Total\ Number\ of\ products\ sold \times \%\ of\ GHG\ released\ during\ lifetime\ use\ of\ product \times GWP\ of\ the\ GHG)$ Then: Sum across products or product groups $\sum(Use\ phase\ emissions\ from\ product\ or\ product\ group\ 1, 2, 3 \ldots)$ Note: if the % released is unknown 100% should be assumed.

Calculation Methods for Indirect Use Phase Emissions

Typical Use Phase Profile Method

For products that indirectly consume energy or emit GHGs (see Table 4.7), the reporting company should calculate emissions by creating or obtaining a typical use phase profile over the lifetime of the product and multiplying them by relevant emission factors.

Activity Data Needed

- Average number of uses over lifetime of product
- Average use scenarios (e.g. weighted average of scenarios)
- Fuel consumed in use scenarios
- Electricity consumed in use scenarios
- Refrigerant leakage in use scenarios
- GHGs emitted indirectly in use scenarios

Emission Factors Needed

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

Data Collection Guidance

The generation of a typical use phase may be difficult as the same product may consume more or less energy dependent on the conditions in which it is used. For example, a potato may be roasted, boiled and microwaved, each using different amount of energy and hence different emissions.

Therefore, it is important to generate a use profile which is representative of use scenarios over the lifetime of the product by the intended consumer population. These may come from sources such as:

- Industry recognised benchmark testing specifications
- Product Category Rules
- Previous emissions studies
- Consumer studies

Companies may choose to identify several different use phase scenarios for a product and create a weighted average based upon actual activity.

Calculation Formula- Use of Sold Products (Indirect Use Phase), Typical Use Phase Profile Method

Indirect use phase emissions of products =

Sum across fuels consumed from use scenarios:

$$\sum Total\ lifetime\ expected\ uses\ of\ product \times \%\ of\ total\ lifetime\ uses\ using\ this\ scenario \times Number\ sold\ in\ reporting\ period \times fuel\ consumed\ per\ use\ in\ this\ scenario\ (e.g.\ kWh) \times Emission\ factor\ for\ fuel(e.g.\ kg\ CO2e/kWh)$$

+

Sum across electricity consumed from use scenarios:

$$\sum Total\ lifetime\ expected\ uses\ of\ product \times \%\ of\ total\ lifetime\ uses\ using\ this\ scenario \times Number\ sold\ in\ reporting\ period \times electricity\ consumed\ per\ use\ in\ this\ scenario\ (kWh) \times Emission\ factor\ for\ electricity(kg\ CO2e/kWh)$$

+

Sum across refrigerant leakage from use scenarios:

$$\sum Total\ lifetime\ expected\ uses\ of\ product \times \%\ of\ total\ lifetime\ uses\ using\ this\ scenario \times Number\ sold\ in\ reporting\ period \times refrigerant\ leakage\ per\ use\ in\ this\ scenario\ (kg) \times Emission\ factor\ for\ refrigerant(kg\ CO2e/kg)$$

+

Sum across GHG emitted indirectly from use scenarios:

$$\sum Total\ lifetime\ expected\ uses\ of\ product \times \%\ of\ total\ lifetime\ uses\ using\ this\ scenario \times Number\ sold\ in\ reporting\ period \times GHG\ emitted\ indirectly\ (kg) \times GWP\ of\ the\ GHG$$

Example

Company A produces washing liquid which indirectly consume electricity during the use phase. Company A collects average data from consumer journals the average behavior of washing clothes and obtains average electricity emission factor from lifecycle databases. The data is summarised in the table below:

Usage Setting	Lifetime uses per product (washes)	Percentage using setting	Products sold	Electricity consumed per use (kWh)	Emission Factor (kg CO_2e/kWh)
30C Cotton Wash	1000	20%	1000	0.40	0.5
40C Cotton Wash		40%		0.50	0.5
90C Cotton Wash		40%		1.20	0.5

Note: The activity data and emissions factors are illustrative only, and do not refer to actual data.

Emissions for each use phase scenario is calculated as follows:

$$\sum Total\ lifetime\ expected\ uses\ of\ product\ \times\ \%\ of\ total\ lifetime\ uses\ using\ this\ scenario \times Number\ sold\ in\ reporting\ period \times electricity\ consumed\ per\ use\ in\ this\ scenario\ (kWh) \times Emission\ factor\ for\ electricity(kg\ CO2e/kWh)$$

30C Cotton Wash:
$= 1{,}000 \times 0.2 \times 1{,}000 \times 0.4 \times 0.5$
$= 40{,}000\ kg\ CO2e$

40C Cotton Wash:
$= 1{,}000 \times 0.4 \times 1{,}000 \times 0.5 \times 0.5$
$= 100{,}000\ kg\ CO2e$

90C Cotton Wash:
$= 1{,}000 \times 0.4 \times 1{,}000 \times 1.2 \times 0.5$
$= 240{,}000\ kg\ CO2e$

Total emissions from use of sold products:
$= emissions\ from\ 30C + emissions\ from\ 40C + emissions\ from\ 90C$
$= 40{,}000 + 100{,}000 + 240{,}000$
$= 380{,}000\ kg\ CO2(e)$

Calculation Methods for Emissions Intensity Metrics

Functional-Unit Method

The scope 3 Standard states that companies may report emissions intensity metrics to avoid misinterpretation of emission results as more durable products with longer lifetimes would at first appear to have higher lifetime use phase emissions.

To convert absolute emissions to an emissions intensity metric, companies should calculate emissions on a per function unit basis. The functional unit is a unit of measurement which allows standardisation of the core function of a product. The functional unit allows the consumer to understand:

- The emissions which arise each time a product is used;
- How these emissions change when any alteration is made to the lifecycle of that product

Examples of emissions intensity metrics using functional units include emissions per hour of use, is given in the following table:

Product	Emissions intensity metric
Can of cola	kg CO_2e per 330ml can
Washing machine	kg CO_2e per wash
Television	kg CO_2e per hour of viewing

Car	kg CO_2e per kilometer driven

Example: An automaker manufactures one million cars in 2010. Each car has an expected lifetime of ten years. In 2011, the company reports the anticipated use phase emissions of the one million cars it produced in 2010 over their ten year expected lifetime. The company also reports corporate average fuel economy (km per liter) and corporate average kg CO_2e/km as relevant emissions intensity metrics.

Calculation Formula - Use of Sold Products (Intensity Metrics), Functional Unit Method
The reporting company must first decide on the functional unit to apply to the product. The emissions intensity metric is then calculated as follows:

Emissions per Functional Unit of product =

Number of functional units performed over lifetime of sold products:

$$Functional\ units\ performed\ per\ product \times Total\ number\ of\ products\ sold$$

Then:

$$\frac{Total\ lifetime\ emissions}{Number\ of\ functional\ units\ performed\ over\ lifetime\ of\ sold\ products}$$

Example

Company A in the example above decides to report an emissions intensity metric to give context to the use phase emissions of its washing machine. Based on the results of the example above and a functional unit of "per wash", emissions per functional unit is calculated as follows:

Number of functional units performed over lifetime of sold products:

$Functional\ units\ performed\ per\ product \times Total\ number\ of\ products\ sold$

$= 1{,}000 \times 1{,}000$

$= 1{,}000{,}000\ functional\ units\ performed\ over\ lifetime\ of\ sold\ products$

Total lifetime emissions:

$= 380{,}000\ kg\ CO2(e)$ (worked out from example above)

$$Emissions\ intensity\ metric = \frac{Total\ lifetime\ emissions}{Number\ of\ functional\ units\ performed\ over\ lifetime\ of\ sold\ products}$$

$$= \frac{380{,}000}{1{,}000{,}000}$$

$= 0.38\ kg\ CO2e\ per\ wash$

Calculation Methods for Sold Intermediate Products

Many companies sell intermediate products with multiple different uses. Intermediate goods require further processing, transformation, or inclusion in another product before being used by the end consumer.

In certain cases, the eventual end use of sold intermediate products may be unknown. For example, a company may produce an intermediate product with many potential downstream applications, each of which has a different GHG emissions profile, and be unable to reasonably estimate the downstream emissions associated with the various end uses of the intermediate product. If such a case, companies may disclose and justify the exclusion of all downstream emissions related to sold intermediate products. For more information, see Chapter 5 (Setting the Boundary) of the *Scope 3 Standard*.

Where practicable, companies may choose to calculate the most common use(s) of the product, and work out a weight average of final products produced in order to calculate use phase emissions using one of the above methods. Emissions should be allocated to the sold intermediate product, and not to the final product.

Example

Company A manufactures circuit boards which are used in a number of different electronic products. Company A sold a total of 10,000 circuit boards to the sells to the following companies:

Company	% of Total Sales	Final Product Produced	Total Lifetime uses of sold products	Emissions per Use of Circuit Board (kg CO_2e/hour of use)
Company B	50%	Irons	3,000	0.3
Company C	30%	Televisions	5,000	0.1
Company D	20%	Microwaves	4,000	0.05

Company A works out the direct use phase emissions of its sold circuit boards as follows:

$$Total\ use\ phase\ emissions\ =$$
$$\sum Total\ intermediate\ products\ sold \times \%\ of\ total\ sales\ to\ downstream\ company \times$$
$$total\ lifetime\ uses\ of\ final\ sold\ product \times$$
$$emissions\ per\ use\ of\ sold\ intermediate\ product\ (kg\ CO2e/use)$$

$$= (10000 * 0.5 * 3000 * 0.3) + (10000 * 0.3 * 5000 * 0.1) + (10000 * 0.2 * 4000 * 0.05)$$
$$= 6{,}400{,}000\ kg\ CO2e$$

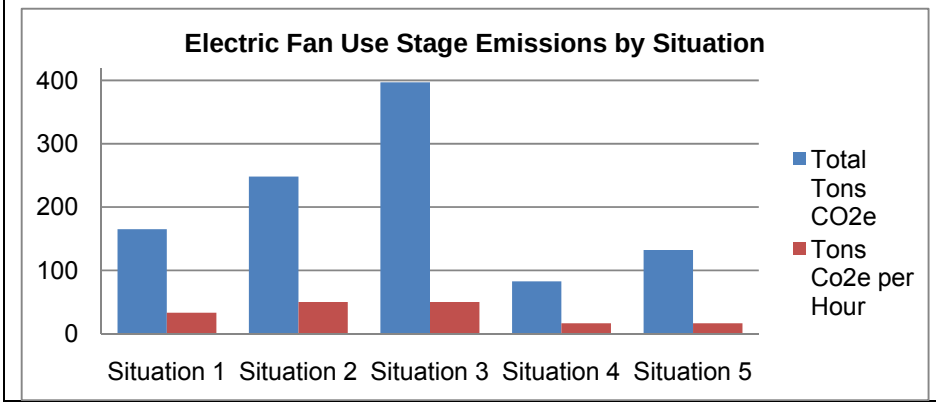
Situational Uncertainty in Calculating Emissions from the Use of Sold Products

Situational uncertainty assessment (also known as sensitivity analysis) is a useful tool to understand how changes in the product's design, use, and disposal could impact inventory results. Situational uncertainty can be thought of as the impact of potential situations other than the conditions and assumptions made in the product's inventory results and report.

Example

Company A produces electric fans for residential consumers. Company data indicates that consumers use the electric fan an average of 40 days a year, with an average use of 6 hours/day for a total of 5 years before disposing of the fan. For both the reporting company and stakeholders, it may be interesting to consider how a change in the use pattern would change the inventory results. The company decides to calculate use stage emissions for the following situations:

Situation	Use Days/Year	Use Hours/Day	Use Life Span
Situation 1	40	6	5
Situation 2	60	6	5
Situation 3	60	6	8
Situation 4	20	6	5
Situation 5	20	6	8



Summary of Calculation Methods for Category 11 (Use of sold products)

Method	Calculation Formula	Activity Data Needed	Emission Factor Needed
Direct Use Phase Emissions			
1. Energy Using Products **Lifetime-Uses Method**	Sum across fuels consumed from use of products: $\sum Total\ lifetime\ expected\ uses\ of\ product \times Number\ sold\ in\ reporting\ period \times fuel\ consumed\ per\ use\ (kWh) \times Emission\ factor\ for\ fuel\ (kg\ CO2e/kWh))$ + Sum across electricity consumed from use of products: $\sum Total\ lifetime\ expected\ uses\ of\ product \times Number\ sold\ in\ reporting\ period \times electricity\ consumed\ per\ use\ (kWh) \times Emission\ factor\ for\ electricity(kg\ CO2e/kWh)$ + Sum across refrigerant leakage from use of products: $\sum Total\ lifetime\ expected\ uses\ of\ product \times Number\ sold\ in\ reporting\ period \times refrigerant\ leakage\ per\ use\ (kg) \times Emission\ factor\ for\ refrigerant(kg\ CO2e/kg)$	• Total lifetime expected uses of product(s); and • Quantities of products sold • Fuel used per use of product • Electricity consumption per use of product • Refrigerant leakage per use of product	• Emission factors for fuels • Emission factors for electricity • Emission factors for refrigerants
2. Fuels and Feed-stocks **Combustion-Method**	Emissions from fuel = Sum across fuels/feedstocks $\sum Total\ quantity\ of\ fuel/feedstock\ sold\ (e.g.\ kWh) \times Combustion\ emission\ factor\ for\ fuel/feedstock(e.g.\ kg\ CO2e/kWh)$	• Total quantities of fuels/feedstocks sold	• Combustion emission factors of fuel/feedstock
3. Product Containing GHGs that are Emitted During Use **% GHG Released Method**	Emissions from products emitting GHGs during use = Sum across GHGs released in a product or product group: $\sum(GHG\ contained\ per\ product \times Total\ Number\ of\ products\ sold \times \%\ of\ GHG\ released\ during\ lifetime\ use\ of\ product \times GWP\ of\ the\ GHG)$ Then: Sum across products or product groups $\sum(Use\ phase\ emissions\ from\ product\ or\ product\ group\ 1, 2, 3 \ldots)$ Note: if the % released is unknown 100% should be assumed.	• Total quantities of products sold • Quantities of GHGs contained per product • % of GHGs released throughout the lifetime of the product	• GWP of the GHGs contained in the product, expressed in units of carbon dioxide per unit kilogram of the GHG (e.g. 25 kg CO2/kg)

Indirect Use Phase Emissions			
1. Typical Use Phase Profile Method	Sum across fuels consumed from use scenarios: $\sum Total\ lifetime\ expected\ uses\ of\ product \times \%\ of\ total\ lifetime\ uses\ using\ this\ scenario \times Number\ sold\ in\ reporting\ period \times fuel\ consumed\ per\ use\ in\ this\ scenario\ (e.g.kWh) \times Emission\ factor\ for\ fuel(e.g.kg\ CO2e/kWh)$ + Sum across electricity consumed from use scenarios: $\sum Total\ lifetime\ expected\ uses\ of\ product \times \%\ of\ total\ lifetime\ uses\ using\ this\ scenario \times Number\ sold\ in\ reporting\ period \times electricity\ consumed\ per\ use\ in\ this\ scenario\ (kWh) \times Emission\ factor\ for\ electricity(kg\ CO2e/kWh)$ + Sum across refrigerant leakage from use scenarios: $\sum Total\ lifetime\ expected\ uses\ of\ product \times \%\ of\ total\ lifetime\ uses\ using\ this\ scenario \times Number\ sold\ in\ reporting\ period \times refrigerant\ leakage\ per\ use\ in\ this\ scenario\ (kg) \times Emission\ factor\ for\ refrigerant(kg\ CO2e/kg)$ + Sum across GHG emitted indirectly from use scenarios: $\sum Total\ lifetime\ expected\ uses\ of\ product \times \%\ of\ total\ lifetime\ uses\ using\ this\ scenario \times Number\ sold\ in\ reporting\ period \times GHG\ emitted\ indirectly\ (kg) \times GWP\ of\ the\ GHG$	• Average number of uses over lifetime of product • Average use scenarios (e.g. weighted average of scenarios) • Fuel consumed in use scenarios • Electricity consumed in use scenarios • Refrigerant leakage in use scenarios • GHGs emitted indirectly in use scenarios	• Combustion emission factors of fuels and electricity • GWP of GHGs
2. Functional Unit Method	Emissions per Functional Unit of product = Number of functional units performed over lifetime of sold products: $Functional\ units\ performed\ per\ product \times Total\ number\ of\ products\ sold$ Then: $\frac{Total\ lifetime\ emissions}{Number\ of\ functional\ units\ performed\ over\ lifetime\ of\ sold\ products}$	N/A	N/A

1

Category 12. End-of-Life Treatment of Sold Products

Category Description

This category includes emissions from the waste disposal and treatment of products sold by the reporting company (in the reporting year) at the end of their life.

This category includes the total expected end-of-life emissions from all products sold in the reporting year. End-of-life treatment methods (e.g. landfilling, incineration) are described in category 5 (Waste generated in operations). See section 5.4 for more information on the time boundary of scope 3 categories, including category 12. A reporting company's scope 3 emissions from end-of-life treatment of sold products include the scope 1 and scope 2 emissions of waste management companies.

See section 5.6 for guidance on the applicability of category 12 to final products and intermediate products sold by the reporting company and box 5.8 for guidance on accounting for emissions from recycling, which applies to both category 5 and category 12. Calculating emissions from category 12 requires assumptions about the end-of-life treatment methods used by consumers. Companies are required to report a description of the methodologies and assumptions used to calculate emissions.

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

The emissions from downstream end-of-life treatment of sold products should follow the same calculation methods as set out in category 5 (see Category 5. Upstream: Waste Generated in Operations), with the difference that instead of collecting data on total mass of waste generated during operation companies should instead collect data on total mass of sold products at end of life after use by consumers.

The major difference between calculating upstream and downstream emissions of waste treatment is likely to be the availability and quality of waste activity data. Whereas the reporting company is likely have specific waste type and waste treatment data from its own operations, this information is likely to be more difficult to obtain for sold products. This is because the reporting company may know the product's components, but may not know the waste disposal behaviour of consumers varies across different geographic regions.

For guidance on accounting for emissions from recycling, see the guidance provided for Category 5, which applies to both Category 5 and Category 12.

Activity Data Needed

Companies should collect:

- Total mass of sold products at end of life after consumer use
- Proportion of this waste being treated by different methods (e.g. % landfilled, incinerated, recycled, etc)

As many waste operators charge for waste by disposal method this may be collected from utility bills. The information may also be stored on internal IT systems.

Emission Factors Needed

Companies should collect:

- Average waste treatment specific emission factors based upon all waste disposal types

Data Collection Guidance

When collecting data on total waste produced, the reporting company should collect data on the waste type(s) and amounts after the products are consumed. This should include any packaging and product waste. For food and drink items, companies should refer to average proportion of food/drinks wasted. In many cases total waste will be equal to the total products sold in reporting year, however in food and drink products this is likely to be lower.

For example, the organisation Waste Resources and Action Programme (WRAP) publishes average food and drinks waste as a proportion of purchased amount in the UK economy (see

http://www.wrap.org.uk/retail_supply_chain/research_tools/research/report_household.html). This may be used in the absence of product specific data.

When collecting data on the proportion of waste treated by different waste treatment methods, companies may refer to:

- Company's own research and internal data on how its products are treated after consumption;
- Specific government directives on waste treatment of certain products (e.g. Waste Electrical and Electronic Equipment Directive);
- Industry associations or organisations who have conducted research into consumer disposal patterns of specific products; and/or
- Average data on waste treatment after consumer use

For example, the EU publishes data on average end of life treatment scenarios of different products groups in different EU member countries (see http://epp.eurostat.ec.europa.eu/portal/page/portal/waste/introduction/).

Calculation Formula - End-of-Life Treatment of Sold Products

Emissions from End-of-life Treatment of Sold Products=
Sum across waste treatment methods: $\sum Total\ mass\ of\ sold\ products\ at\ end\ of\ life\ after\ consumer\ use\ (kg)$ $\times\ \%\ of\ total\ waste\ being\ treated\ by\ waste\ treatment\ method$ $\times\ emission\ factor\ of\ waste\ treatment\ method\ (kg\ CO2e/kg)$

Example

Company A sells paper which is laminated in a way which does not allow recycling. In the reporting period Company A sold 10,000 tonnes of product. The company conducts consumer research to understand the disposal methods used by end consumers.

The company also collects data for emission factors associated with each of the disposal methods for laminated paper products form a Life Cycle Assessment Database:

Mass of Waste After Consumer use (kg)	Waste Treatment	Proportion of Waste Produced	Emission Factor of Waste Treatment Method
10,000	Landfill	90%	0.3 kg CO_2e/kg
	Incinerated	10%	1 kg CO_2e/kg
	Recycled	0%	0 kg CO_2e/kg

$$\sum Total\ mass\ of\ sold\ products\ at\ end\ of\ life\ after\ consumer\ use\ (kg)$$
$$\times\ \%\ of\ total\ waste\ being\ treated\ by\ waste\ treatment\ method$$
$$\times\ emission\ factor\ of\ waste\ treatment\ method\ (kg\ CO2e/kg)$$
$$= (10{,}000 \times 90\% \times 0.3) + (10{,}000 \times 10\% \times 1) + (10{,}000 \times 0\% \times 0)$$
$$=$$ 3,700 kg CO_2e

Summary of Calculation Methods for Category 12 (End-of-life treatment of sold products)

Method	Calculation Formula	Activity Data Needed	Emission Factor Needed
Calculation Method	Sum across waste treatment methods: $\sum Total\ mass\ of\ sold\ products\ at\ end\ of\ life\ after\ consumer\ use\ (kg)$ $\times \%\ of\ total\ waste\ being\ treated\ by\ waste\ treatment\ method$ $\times\ emission\ factor\ of\ waste\ treatment\ method\ (kg\ CO2e/kg)$	• Total mass of sold products at end of life after consumer use • Proportion of this waste being treated by different methods (e.g. % landfilled, incinerated, recycled, etc)	• Average waste treatment specific emission factors based upon all waste disposal types

Category 13: Downstream Leased Assets (Not Included in Scope 1 or 2)

Category Description

This category includes emissions from the operation of assets that are owned by the reporting company (acting as lessor) and leased to other entities in the reporting year that are not already included in scope 1 or scope 2. This category is applicable to lessors (i.e., companies that receive payments from lessees). Companies that operate leased assets (i.e., lessees) should refer to category 8 (Upstream leased assets).

Leased assets may be included in a company's scope 1 or scope 2 inventory depending on the type of lease and the consolidation approach the company uses to define its organizational boundaries. (See section 5.2 for more information.) If the reporting company leases an asset for only part of the reporting year, the reporting company should account for emissions from the portion of the year that the asset was leased.

In some cases, companies may not find value in distinguishing between products sold to customers (accounted for in category 11) and products leased to customers (accounted for in category 13). Companies may account for products leased to customers the same way the company accounts for products sold to customers (i.e., by accounting for the total expected lifetime emissions from all relevant products leased to other entities in the reporting year). In this case, companies should report emissions from leased products in category 11 (Use of sold products), rather than category 13 (Downstream leased assets) and avoid double counting between categories.

A reporting company's scope 3 emissions from downstream leased assets include the scope 1 and scope 2 emissions of lessees (depending on the lessee's consolidation approach).

Calculating Emissions from Leased Assets

Downstream leased assets differ from upstream leased assets in that the leased assets are owned by the reporting company. In practice, this often makes collecting site-specific data for the assets an easier task than collecting for upstream emissions, as information is likely to be more readily available.

The calculation methods for upstream and downstream leased assets do not differ. For guidance on calculating emissions from Leased Assets (Downstream), refer to the guidance for Category 8 Leased Assets (Upstream),

Category 14: Franchises (Not included in Scope 1 or 2)

Category Description

This category includes emissions from the operation of franchises not included in scope 1 or scope 2. A franchise is a business operating under a license to sell or distribute another company's goods or services within a certain location. This category is applicable to franchisors (i.e., companies that grant licenses to other entities to sell or distribute its goods or services in return for payments, such as royalties for the use of trademarks and other services). Franchisors should account for emissions that occur from the operation of franchises (i.e., the scope 1 and 2 emissions of franchisees) in this category.

Franchisees (i.e., companies that operate franchises and pay fees to a franchisor) should include emissions from operations under their control in this category if they have not included those emissions in scope 1 and scope 2 due to their choice of consolidation approach. Franchisees may optionally report upstream scope 3 emissions associated with the franchisor's operations (i.e., the scope 1 and scope 2 emissions of the franchisor) in category 1 (Purchased goods and services).

Calculating Emissions from Franchises

Companies may use either of two methods to calculate emissions from franchises:

- **Franchise-Specific Method**, which involves collecting site-specific fuel and energy data from individual franchises; or
- **Average-Data Method**, which involves estimating emissions for each franchise, or groups of franchises, based on average statistics, such as average emissions per franchise type or floor space.

Option 1: Franchise-Specific Method

The primary data approach involves collecting site-specific fuel and energy data from individual franchises.

Activity Data Needed

Companies should collect data on:

- Site-specific fuel and electricity use

Emission Factors Needed

Companies should collect:

- Site or regionally specific emission factors for energy sources (e.g. electricity and fuels) per unit of consumption (e.g. kg CO_2e/kWh for electricity, kg CO_2e/liter for diesel); and
- Emission factors of process emissions

Data Collection Guidance

Data sources for activity data include:

- Utility bills
- Purchase records
- Meter readings
- Internal IT systems

Data sources for emission factors include:

- Life cycle databases
- Company developed emission factors
- Industry associations=

Calculation Formula – Franchises, Franchise-Specific Method

To calculate scope 3 emissions from franchises, aggregate the scope 1 and scope 2 emissions of all franchises, using this formula:

Reporting Company' s Scope 3 Emissions from Franchises (Downstream) =
Sum Across by Franchises $\sum Scope\ 1\ Emissions + Scope\ 2\ Emissions\ of\ Each\ Franchise\ (kg\ CO2e)$

Franchises that operate in a portion of a building where energy use is not separately sub-metered may estimate energy consumed using the franchise's share of the building's total floor space and total building energy use, following this formula:

$$\text{Energy use from Franchise (kWh)} = \frac{\text{Franchise's Area (m}^2\text{)}}{\text{Building's Total Area (m}^2\text{)}} \times \frac{\text{Building's Total Energy Use}}{\text{Building's Occupancy Rate (e.g., 0.75)}}$$

Using Samples

Where a company has a large number of individual franchises, it may not be practical to collect data from each individual franchise. Therefore, companies may use appropriate sampling techniques when collecting data that will represent all franchises, by extrapolating from a representative sample of franchises. See section 0.4 for more information.

Companies may also choose to categorize franchises into similar groups for data collection. The grouping strategy should group franchises with similar anticipated emissions intensities. Below is a non-exclusive list of possible ways to group franchises:

- Location, (e.g., country - particularly where electricity emission factors differ significantly between countries)
- Building type (e.g., free-standing buildings; leased shop space in shopping centres; shop-front at base of larger city building)
- Floor space
- Financial turnover
- Product volume
- Customer numbers
- Distinctive characteristics (e.g., gyms with saunas, hotels with pools)

Companies that extrapolate from a representative sample within a franchise group should use the formula described above to calculate emissions from sampled franchises within group, and then apply the formula in Step 1 below to estimate emissions for a franchise group.

Companies should then use the formula in Step 2 below to aggregate franchise groups to the company's total emissions from franchises.

Step 1: Aggregation of franchise emissions per group Franchise emissions per defined asset group =
$Total\ emissions\ from\ sampled\ franchises\ within\ group \times \left(\frac{Total\ number\ of\ franchises\ within\ group}{Number\ of\ franchises\ sampled\ within\ group}\right)$

Step 2: Aggregation of total franchise emissions across all groups =
Sum Across by Franchise Groups: $\sum Total\ Scope\ 1\ and\ Scope\ 2\ Emissions\ from\ Each\ Asset\ Group$

Example

Company A has multiple franchisees that operate a number of restaurants. Company A requests for the total scope 1 and 2 emissions of each of the franchisees:

Franch□see	Scope 1 emissions	Scope 2 □missions
Franchisee 1	100,000	20□000
Franchisee 2	25,000	10,000
Franchisee 3	30,000	10,000
Franchisee 4	90,000	30,000
Franchisee 5	30,000	10,000

Note that emissions are for illustrative purposes only

Company A can then perform the following calculation:

$= \sum Total\ Scope\ 1\ and\ Scope\ 2\ Emissions\ from\ franchisees\ (kg\ CO2e)$
$= (100{,}000 + 20{,}000) + (25{,}000 + 10{,}000) + (30{,}000 + 10{,}000) + (90{,}000 + 30{,}000) + (30{,}000 + 10{,}000)$

$= 355{,}000\ kg\ CO2e$

Option 2: Average-Data Method

The Average data approach involves estimating emissions for each franchise, or groups of franchises, based on average statistics, such as average emissions per building type, floor space or franchise type. The secondary data approach should be used when purchase records, electricity bills, or meter readings of fuel or energy use are not available or applicable. Approaches include:

- Estimated emissions based on occupied floor space by building type
- Estimated emissions based on number and type of franchises

Note that the Average data approach may be relatively inaccurate and limits the ability of companies to track performance of GHG reduction actions.

Activity Data Needed
Companies should collect data on:

- Floor space of each franchise, by floor space
- Number of franchises, by building type
- Number of franchise assets that give rise to Scope 2 emissions (e.g. company cars, trucks, etc).

Emission Factors Needed
Companies should collect:

- Average emission factors by floor space, expressed in units of emissions per square meter, square foot occupied (e.g. kg CO_2e/m^2)
- Average emission factors by building type, expressed in units of emissions per building (e.g. kg CO_2e/small office block)
- Emission factors by asset type, expressed in units of emissions per asset (e.g. kg CO_2e/car)

Calculation Formula Franchises, Average-Data Method
If floor space data is available:

Reporting Company' s Scope 3 Emissions from Franchises (Downstream)=

Sum across building types:
$\sum Floor\ Space\ (m2) \times\ Average\ Emission\ Factor\ (kg\ CO2\ e/m2/year\ )$

If floor space data is not available:

Reporting Company' s Scope 3 Emissions from Franchises (Downstream)=
Sum across building/asset types: $\sum Building\ or\ Type \times Average\ Emissions\ Per\ Building\ or\ Asset\ Type\ (kg\ CO2e/building\ or\ Asset\ type)$

Calculation Resources:

- The U.S. Energy information Administration has developed a dataset on average energy use by building type. Commercial Buildings Energy Consumption Survey, at http://www.eia.doe.gov/emeu/cbecs

Example

Company A has multiple franchisees who operate a combination of food outlets and clothing outlets. To calculate the emissions of the franchisee company A collects the following data:

Franchisee	Type	Shop area (m2)	Emission Factor (kg CO2e/m2/year)
Franchisee 1	Food Outlet	100	30,000
Franchisee 2	Food Outlet	150	30,000
Franchisee 3	Clothing Outlet	400	10,000
Franchisee 4	Clothing Outlet	700	10,000
Franchisee 5	Clothing Outlet	500	10,000

Note that all emissions factors are used for illustrative purposes only

Company A can then perform the following calculation:

Emissions from franchises =
$\sum Building\ or\ Type \times Average\ Emissions\ Per\ Building\ or\ Asset\ Type\ (kg\ CO2e/building\ or\ Asset\ type)$
$= (100 \times 30{,}000) + (150 \times 30{,}000) + (400 \times 10{,}000) + (700 \times 10{,}000) + (500 \times 10{,}000)$
$= 23{,}500{,}000\ kg\ CO2e$

Summary of Calculation Methods for Category 14 (Franchises)

Method	Calculation Formula	Activity Data Needed	Emission Factor Needed
1.Franchise Specific Method	Sum Across by Franchises $\sum Scope\ 1\ Emissions + Scope\ 2\ Emissions\ of\ Each\ Franchise\ (kg\ CO2e)$ $\text{Energy use from Franchise (kWh)} =$ $\frac{\text{Franchise's Area (m}^2\text{)}}{\text{Building's Total Area (m}^2\text{)}} \times \frac{\text{Building's Total Energy Use}}{\text{Building's Occupancy Rate (e.g., 0.75)}}$	• Site-specific fuel and electricity use	• Site or regionally specific emission factors for energy sources (e.g. electricity and fuels) per unit of consumption (e.g. kg CO2e/kWh for electricity, kg CO2e/liter for diesel); and • Emission factors of process emissions
2.Average Data Method	Sum across building types: $\sum Floor\ Space\ (m2) \times\ Average\ Emission\ Factor\ (kg\ CO2\ e/m2/year\ )$ If floor space data is not available: Sum across building/asset types: $\sum Building\ or\ Type$ $\times\ Average\ Emissions\ Per\ Building\ or\ Asset\ Type\ (kg\ CO2e\ /building\ or\ Asset\ type)$	• Floor space of each franchise, by floor space • Number of franchises, by building type • Number of franchise assets that give rise to Scope 2 emissions (e.g. company cars, trucks, etc).	• Average emission factors by floor space, expressed in units of emissions per square meter, square foot occupied (e.g. kg CO2e/m2) • Average emission factors by building type, expressed in units of emissions per building (e.g. kg CO2e/small office block) • Emission factors by asset type, expressed in units of emissions per asset (e.g. kg CO2e/car)

Category 15: Investments (Not Included in Scope 1 and 2)

Category Description

This category includes scope 3 emissions associated with the reporting company's investments in the reporting year, not already included in scope 1 or scope 2. This category is applicable to investors (i.e., companies that make an investment with the objective of making a profit) and companies that provide financial services. Investments are categorized as a downstream scope 3 category because the provision of capital or financing is a service provided by the reporting company.

Category 15 is designed primarily for private financial institutions (e.g., commercial banks), but is also relevant to public financial institutions (e.g., multilateral development banks, export credit agencies, etc.) and other entities with investments not included in scope 1 and scope 2.

Investments may be included in a company's scope 1 or scope 2 inventory depending on how the company defines its organizational boundaries. For example, companies that use the equity share approach include emissions from equity investments in scope 1 and scope 2. Companies that use a control approach account only for those equity investments that are under the company's control in scope 1 and scope 2. Investments not included in the company's scope 1 or scope 2 emissions are included in scope 3, in this category. A reporting company's scope 3 emissions from investments are the scope 1 and scope 2 emissions of investees.

For purposes of GHG accounting, this standard divides financial investments into four types:

- Equity investments
- Debt investments
- Project finance
- Managed investments and client services

Table 5.9 and table 5.10 provide GHG accounting guidance for each type of financial investment. Table 5.9 provides the types of investments included in the minimum boundary of this category. Table 5.10 identifies types of investments that companies may optionally report, in addition to those provided in table 5.9.

Emissions from investments should be allocated to the reporting company based on the reporting company's proportional share of investment in the investee. Because investment portfolios are dynamic and can change frequently throughout the reporting year, companies should identify investments by choosing a fixed point in time, such as December 31 of the reporting year, or using a representative average over the course of the reporting year.

Table 5.9. Accounting for emissions from investments (required)

Financial Investment/ Service	Description	GHG Accounting Approach (Additional guidance on italicized terms is provided below)
Equity investments	Equity investments made by the reporting company using the company's own capital and balance sheet, including: • Equity investments in subsidiaries (or group companies), where the reporting company has financial control (typically more than 50 percent ownership) • Equity investments in associate companies (or affiliated companies), where the reporting company has significant influence but not financial control (typically 20-50 percent ownership) • Equity investments in joint ventures (Non-incorporated joint ventures/partnerships/ operations), where partners have joint financial control	In general, companies in the financial services sector should account for emissions from equity investments in scope 1 and scope 2 by using the equity share consolidation approach to obtain representative scope 1 and scope 2 inventories. If emissions from equity investments are not included in scope 1 or scope 2 (because the reporting company uses either the operational control or financial control consolidation approach and does not have control over the investee), account for *proportional scope 1 and scope 2 emissions* of equity investments that occur in the reporting year in scope 3, category 15 (Investments)

	Equity investments made by the reporting company using the company's own capital and balance sheet, where the reporting company has neither financial control nor significant influence over the emitting entity (and typically has less than 20 percent ownership)	If not included in the reporting company's scope 1 and scope 2 inventories: Account for *proportional scope 1 and scope 2 emissions* of equity investments that occur in the reporting year in scope 3, category 15 (Investments).Companies may establish a materiality threshold (e.g., equity share of 1 percent) below which the company excludes equity investments from the inventory, if disclosed and justified.
Debt investments (with known use of proceeds)	Corporate debt holdings held in the reporting company's portfolio, including corporate debt instruments (such as bonds or convertible bonds prior to conversion) or commercial loans, with known use of proceeds (i.e., where the use of proceeds is identified as going to a particular project, such as to build a specific power plant)	For each year during the term of the investment, companies should account for *proportional scope 1 and scope 2 emissions* of *relevant projects* that occur in the reporting year in scope 3, category 15 (Investments). In addition, if the reporting company is an initial sponsor or lender of a project: Also account for the *total projected lifetime scope 1 and scope 2 emissions* of *relevant projects* financed during the reporting year and report those emissions separately from scope 3.
Project Finance	Long-term financing of projects (e.g., infrastructure and industrial projects) by the reporting company as either an equity investor (sponsor) or debt investor (financier)	

Additional guidance on key concepts italicized in table 5.9 is provided below.

- **Proportional** emissions from equity investments should be allocated to the investor based on the investor's proportional share of equity in the investee. Proportional emissions from project finance and debt investments with known use of proceeds should be allocated to the investor based on the investor's proportional share of total project costs (total equity plus debt). Companies may separately report additional metrics, such as total emissions of the investee, the investor's proportional share of capital investment in the investee, etc.

- **Scope 1 and scope 2 emissions** include the direct (scope 1) emissions of the investee or project, as well as the indirect scope 2 emissions from the generation of electricity consumed by the investee or project. Where relevant, companies should also account for the scope 3 emissions of the investee or project. For example, if a financial institution provides equity or debt financing to a light bulb manufacturer, the financial institution is required to account for the scope 1 and scope 2 emissions of the light bulb manufacturer (i.e., direct emissions during manufacturing and indirect emissions from electricity consumed during manufacturing). The financial institution should account for the scope 3 emissions of the light bulb producer (e.g., scope 3 emissions from consumer use of light bulbs sold by the manufacturer) when scope 3 emissions are significant compared to other source of emissions or otherwise relevant.

- **Relevant projects** include those in GHG-intensive sectors (e.g., power generation), projects exceeding a specified emissions threshold (developed by the company or industry sector), or projects that meet other criteria developed by the company or industry sector. Companies should account for emissions from the GHG-emitting project financed by the reporting company, regardless of any financial intermediaries involved in the transaction.

- **Total projected lifetime** emissions are reported in the initial year the project is financed, not in subsequent years. Where there is uncertainty around a project's anticipated lifetime, companies may report a range of likely values (e.g., for a coal-fired power plant, a company may report a range over a 30- to 60-year time period). Companies should report the assumptions used to estimate total anticipated lifetime emissions. If project financing occurs only once every few years, emissions from project finance may fluctuate significantly from year to year. Companies should provide appropriate context in the public report (e.g., by highlighting exceptional or non-recurring project financing). See section 5.4 for more information on the time boundary of scope 3 categories.

Table 5.10. Accounting for emissions from investments (optional)

Financial Investment/ Service	Description	GHG Accounting Approach (*Optional*)

Debt investments (without known use of proceeds)	General corporate purposes debt holdings (such as bonds or loans) held in the reporting company's portfolio where the use of proceeds is not specified	Companies may account for scope 1 and scope 2 emissions of the investee that occur in the reporting year in scope 3, category 15 (Investments)
Managed investments and client services	Investments managed by the reporting company on behalf of clients (using clients' capital) or services provided by the reporting company to clients, including: • Investment and asset management (equity or fixed income funds managed on behalf of clients, using clients' capital) • Corporate underwriting and issuance for clients seeking equity or debt capital • Financial advisory services for clients seeking assistance with mergers and acquisitions or requesting other advisory services	Companies may account for emissions from managed investments and client services in scope 3, category 15 (Investments)
Other investments or financial services	Other investments, financial contracts, or financial services not included above (e.g., pension funds, retirement accounts, securitized products, insurance contracts, credit guarantees, financial guarantees, export credit insurance, credit default swaps, etc.)	Companies may account for emissions from other investments in scope 3, category 15 (Investments)

Calculating Emissions from Investments

Scope 3 emissions from investments may be measured by using the following approaches:

- **Investment-specific approach –** This method involves collecting scope 1 and 2 emissions from the investee (and in some cases the anticipated life-time emissions) and allocating the emissions based upon the share of emissions.
- **Economic-data method –** This method involves using economic data to estimate the emissions from investments.

Companies should use the investment-specific approach where possible. If investment-specific data is unavailable, then the economic-data method may be used.

Option 1: Investment-Specific Approach

The investment specific approach involves collecting scope 1 and 2 emissions directly from investees or projects and allocating these emissions based upon the proportion of the investment (see Note 1 above).

Data needed

For the investment specific approach companies need to collect different sets of activity data dependent on the type of investment;

- Scope 1 and 2 emissions for investment
- The reporting company's proportional share of investment in the investee

Additionally, for project-based investments:

- Anticipated life-time emissions of the project

Data collection guidance

Sources for data may include:

- GHG inventory reports of investee companies
- Financial records of the reporting company

Calculation Formula – Investments, Investment-Specific Approach

Emissions from investments=
Sum across equity investments $\sum(Scope\ 1\ and\ 2\ emissions\ of\ equity\ investment\ \times share\ of\ equity\ (\%))$

+

Sum across debt investments with known use of proceeds

$$\sum(Scope\ 1\ and\ 2\ emissions\ of\ debt\ investment\ (with\ known\ use\ of\ proceeds) \times share\ of\ total\ capital\ (debt + equity)\ (\%))$$

+

Sum across project investments

$$\sum(Scope\ 1\ and\ 2\ emissions\ of\ project\ investment\ \times share\ of\ project\ finance\ (\%))$$

Companies should quantify and separately report:

Sum across project investments

$$\sum(Anticipated\ lifetime\ scope\ 1\ and\ 2\ emissions\ of\ project\ investment \times share\ of\ project\ finance\ (\%))$$

Optionally companies may choose to add to the above:

Sum across debts investments without known use of proceeds

$$\sum(Scope\ 1\ and\ 2\ emissions\ of\ debt\ investment\ (without\ known\ use\ of\ proceeds) \times share\ of\ total\ capital\ (debt + equity)\ (\%))$$

+

Sum across managed investments and client services

$$\sum(Scope\ 1\ and\ 2\ emissions\ of\ managed\ investment\ and\ client\ service \times client\ share\ of\ service\ (\%))$$

+

Sum across other investment categories

$$\sum(Scope\ 1\ and\ 2\ emissions\ of\ other\ investment\ \times share\ of\ investment\ (\%))$$

Example

Company A has 4 investments in its portfolio which are classified as scope 3 emissions. Company A collects scope 1 and 2 emissions associated with the investments by reference to the GHG inventory reports of the investees, and obtains information on the share of the investments from its financial records. Assumptions are made on the lifetime emissions of the project-based investment by reference the GHG inventory report of the project and using extrapolation techniques.

Investment	Investment Type	Scope 1 and 2 emissions in reporting year (tonnes CO2e)	Anticipated lifetime scope 1 and 2 emissions (tonnes CO2e)	Reporting company's share of investment
1	Equity Investment	120	n/a	40%
2	Equity Investment	200	n/a	15%
3	Debt Investment (with known use of proceeds)	160	1000	25%
4	Project Finance	60	1300	25%

Emissions from equity investments:

$$\sum(Scope\ 1\ and\ 2\ emissions\ of\ equity\ investment\ \times share\ of\ equity\ (\%))$$
$$= (120 \times 40\%)\ +\ (200 \times 15\%)$$
$$=\ 78\ tonnes\ CO2e$$

Emissions from debt investments (with known use of proceeds):

$$\sum(Scope\ 1\ and\ 2\ emissions\ of\ debt\ investment\ (with\ known\ use\ of\ proceeds) \times share\ of\ total\ capital\ (\%))$$
$$= 160 \times 25\%$$
$$=\ 40\ tonnes\ CO2e$$

Emissions from project finance:

$$\sum(Annual\ scope\ 1\ and\ 2\ emissions\ of\ project\ \times share\ of\ project\ finance\ (\%))$$

$= 60 \times 25\%$
$= 15\ tonnes\ CO2e$

Total emissions from investments:
$Emissions\ from\ equity\ investments +$
$Emissions\ from\ debt\ investments\ (with\ known\ use\ of\ proceeds) +$
$Emissions\ from\ project\ finance$
$= 78 + 40 + 15$
$= 133\ tonnes\ CO2e$

Separately reported from scope 3:
Projected lifetime emissions of relevant projects (because the reporting company is an initial sponsor/lender of all investments):
$\sum(Anticipated\ lifetime\ Scope\ 1\ and\ 2\ emissions\ of\ project\ investment \times share\ of\ investment\ (\%))$
$= (1000 \times 25\%) + (1300 \times 25\%)$
$= 250 + 325$
$= 575\ tonnes\ CO2e$

Option 2: Economic-data method

The economic-data method uses environmentally extended economic input-output (EEIO) data to calculate the emissions associate with investments. The total spend on investments should be multiplied by appropriate emission factors that are reflective of the sectors of the economy that the investments relates to.

For example, for the financing of an Internet company, an EEIO emission factor for Internet services should be used.

Activity data needed

The reporting company should collect;

- Total spend on investments; and/or
- Total value of debt investments

There is no need to allocate emissions using this method, as the allocation is included within the total spend or value.

Emission Factors needed

The reporting company should collect;

- EEIO emission factors for the sectors of the economy that the investments are related to (kg CO2e/$)

Reporting companies should check the timeliness of EEIO data and account for any significant changes in exchange rates if converting currencies to make these calculations.

Data collection guidance

Data may be collected from the following sources;

- Activity data will be available from financial records
- Emission Factors are available from EEIO databases

The United Kingdom Department of Environment, Food and Rural Affairs (DEFRA) publishes a list of EEIO emission factors for all major sectors of the economy. Available at www.defra.gov.uk/environment/business/reporting/conversion-factors.htm.

Calculation Formula – Investments, Economic-Data method

Emissions from investments
Sum across equity investments $\sum(Equity\ investment\ (\$) \times Emission\ factor\ of\ investment\ sector\ (kg\ CO2e/\$))$

+

Sum across debt investments (with known use of proceeds)

$$\sum(Value\ of\ debt\ investment\ (with\ known\ use\ of\ proceeds\ (\$) \times Emission\ factor\ of\ investment\ sector\ \ (kg\ CO2e/\$))$$

+

Sum across project investments

$$\sum(Total\ spend\ on\ project\ (\$) \times Emission\ factor\ of\ investment\ sector\ \ (kg\ CO2e/\$))$$

Optionally companies may choose to calculate:

Sum across debt investments (without known use of proceeds)

$$\sum(Value\ of\ debt\ investment\ (without\ known\ use\ of\ proceeds\ (\$) \times Emission\ factor\ of\ investment\ sector\ \ (kg\ CO2e/\$))$$

+

Sum across managed investments and client services

$$\sum(Value\ of\ managed\ investments\ and\ client\ services\ (\$) \times Emission\ factor\ of\ investment\ sector\ \ (kg\ CO2e/\$))$$

+

Sum across other investments

$$\sum(Value\ of\ other\ \ investments\ (\$) \times Emission\ factor\ of\ investment\ sector\ \ (kg\ CO2e/\$))$$

Example

Company A is an investment bank. It has a broad portfolio of investments in hundreds of companies across geographic regions. Company A is unable to collect the scope 1 and 2 emissions of their investments as most investees have not conducted GHG inventory reports. Company A decides to use the economic-data method by grouping their investments by the sectors of the economy that the investees are engaged in. It collects EEIO emission factors for those corresponding sectors by reference to EEIO databases.

The information is summarized as follows:

Investment Group	Investment Type	Investment spend or value ($)	Investment Sector	Emission factor of sector (kg CO2e/$)
1	Equity Investment	12,000,000	Food and Drink	2.00
2	Equity Investment	52,000,000	Telecommunication	0.60
3	Debt Investment	55,000,000	Pharmaceutical	0.50
4	Project Finance	25,000,000	Energy Generation	1.00

Emissions from equity investments:

$$\sum(Equity\ investment\ (\$) \times Emission\ factor\ of\ investment\ sector\ (kg\ CO2e/\$))$$
$$= (12{,}000{,}000 \times 2) + (52{,}000{,}000 \times 0.6)$$
$$= 55{,}200{,}000\ kg\ CO2e$$

Emissions from debt investments:

$$\sum(Value\ of\ debt\ investment\ (with\ known\ use\ of\ proceeds\ (\$) \times Emission\ factor\ of\ investment\ sector\ \ (kg\ CO2e/\$))$$
$$= 55{,}000{,}000 \times 0.5$$
$$= 27{,}500{,}000\ kg\ CO2e$$

Emissions from project finance:

$$\sum(Total\ spend\ on\ project\ (\$) \times Emission\ factor\ of\ investment\ sector\ \ (kg\ CO2e/\$))$$
$$= 25{,}000{,}000 \times 1$$
$$= 25{,}000{,}000\ kg\ CO2e$$

Total Emissions from Investments:

$$Emissions\ from\ equity\ investments + Emissions\ from\ debt\ investments + Emissions\ from\ project\ finance$$
$$= 55{,}200{,}000 + 27{,}500{,}000 + 25{,}000{,}000$$
$$= 107{,}700{,}000\ kg\ CO2e$$

1 **Summary of Calculation Methods for Category 15 (Investments)**

2

Method	Calculation Formula	Activity Data Needed	Emission Factor Needed
1.Investment-Specific Approach	Sum across equity investments $\sum(Scope\ 1\ and\ 2\ emissions\ of\ equity\ investment\ \times share\ of\ equity\ (\%))$ + Sum across debt investments with known use of proceeds $\sum(Scope\ 1\ and\ 2\ emissions\ of\ debt\ investment\ (with\ known\ use\ of\ proceeds)$ $\times\ share\ of\ total\ capital\ (debt + equity)\ (\%))$ + Sum across project investments $\sum(Scope\ 1\ and\ 2\ emissions\ of\ project\ investment\ \times share\ of\ project\ finance\ (\%))$ Companies should quantify and separately report: Sum across project investments $\sum(Anticipated\ lifetime\ scope\ 1\ and\ 2\ emissions\ of\ project\ investment$ $\times\ share\ of\ project\ finance\ (\%))$ Optionally companies may choose to add to the above: Sum across debts investments without known use of proceeds $\sum(Scope\ 1\ and\ 2\ emissions\ of\ debt\ investment\ (without\ known\ use\ of\ proceeds)$ $\times\ share\ of\ total\ capital\ (debt + equity)\ (\%))$ + Sum across managed investments and client services $\sum\ (Scope\ 1\ and\ 2\ emissions\ of\ managed\ investment\ and\ client\ service$ $\times\ client\ share\ of\ service\ (\%))$ + Sum across other investment categories $\sum(Scope\ 1\ and\ 2\ emissions\ of\ other\ \ investment\ \times\ share\ of\ investment\ (\%))$	• Scope 1 and 2 emissions for investment • The reporting company's proportional share of investment in the investee • Additionally, for project-based investments: • Anticipated life-time emissions of the project	• Any applicable emission factor for calculation of scope 1 and 2 emissions of the investment
2. Economic Data Method	Sum across equity investments $\sum(Equity\ investment\ (\$) \times Emission\ factor\ of\ investment\ sector\ (kg\ CO2e/\$))$ + Sum across debt investments (with known use of proceeds) $\sum(Value\ of\ debt\ investment\ (with\ known\ use\ of\ proceeds\ (\$)$ $\times Emission\ factor\ of\ investment\ sector\ \ (kg\ CO2e/\$))$	• Total spend on investments; and/or • Total value of debt investments	• EEIO emission factors for the sectors of the economy that the investments are related to (kg

	+ Sum across project investments $\sum(Total\ spend\ on\ project\ (\$) \times Emission\ factor\ of\ investment\ sector\ \ (kg\ CO2e/\$))$ Optionally companies may choose to calculate: Sum across debt investments (without known use of proceeds) $\sum(Value\ of\ debt\ investment\ (without\ known\ use\ of\ proceeds\ (\$)$ $\times Emission\ factor\ of\ investment\ sector\ \ (kg\ CO2e/\$))$ + Sum across managed investments and client services $\sum(Value\ of\ managed\ investments\ and\ client\ services\ (\$)$ $\times Emission\ factor\ of\ investment\ sector\ \ (kg\ CO2e/\$))$ + Sum across other investments $\sum(Value\ of\ other\ \ investments\ (\$) \times Emission\ factor\ of\ investment\ sector\ \ (kg\ CO2e/\$))$		CO2e/$)

1