Beverage Industry Sector Guidance for Greenhouse Gas Emissions Reporting

Beverage Industry Environmental Roundtable
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Beverage Industry
Environmental Roundtable

BEVERAGE INDUSTRY ENVIRONMENTAL ROUNDTABLE – SECTOR GUIDANCE WORKING GROUP

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PROLOGUE

As part of a unified effort to reduce the environmental impact of the beverage industry, leading companies within the industry formed the Beverage Industry Environmental Roundtable (BIER) in August 2006. The members of this roundtable work as a team to identify ways to reduce water, energy and greenhouse gas (GHG) impacts across the value chains of our enterprises and the life cycles of our products.

This document is the product of work by members of BIER to create Sector Guidance for the estimation, tracking and reporting of GHG emissions within the beverage industry. Our hope is to achieve a common methodology for the beverage industry to account for and report their GHG emissions and ensure that reporting members achieve compliance with the two predominant protocols in the field: The Greenhouse Gas Protocol (written by the World Business Council for Sustainable Development [WBCSD] and World Resources Institute [WRI]), and the Publicly Available Specification 2050 (PAS 2050) (prepared by the British Standards Institution [BSI] and co-sponsored by the Carbon Trust and the Department for Environment, Food and Rural Affairs [DEFRA]).

As a Sector Guidance document, no attempt is made to modify or amend The GHG Protocol or PAS 2050, but rather to include clarifications and examples specific to the beverage industry thus making this a value-added document. In addition, the document standardizes calculation steps, provides a directory of data resources and creates specific rules for base year establishment and adjustments. This document is intended to be a living document, and the beverage industry will update it periodically as emerging methodologies become final.

BIER member companies believe uniformity in data collection, recording and communication is of particular importance to our industry. As consumer-facing organizations, uniformity in GHG reporting will provide our consumers, as well as other third-party organizations, with a consistent, comparable and transparent source of important environmental information, while simultaneously safeguarding sensitive and/or proprietary data.

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PREFACE

The *Beverage Industry Sector Guidance for Greenhouse Gas Emissions Reporting* has been developed by BIER for the purpose of achieving consistency in GHG emissions reporting for the beverage industry. To develop this protocol, BIER members have drawn primarily from two documents representing the current methodologies for estimating carbon footprints: The Greenhouse Gas Protocol (written by the World Business Council for Sustainable Development [WBCSD] and World Resources Institute [WRI]), and the Publicly Available Specification 2050 (PAS 2050) (prepared by the British Standards Institution [BSI] and co-sponsored by the Carbon Trust and the Department for Environment, Food and Rural Affairs [DEFRA]).

The *Beverage Industry Sector Guidance for Greenhouse Gas Emissions Reporting* provides beverage industry-specific information and examples that support the requirements of the aforementioned GHG reporting protocols. The focus of supplemental guidance is on those areas which have the greatest impact on beverage companies: agriculture, transportation, packaging, and refrigeration. In developing the Sector Guidance, BIER has also elaborated on the areas where beverage-specific guidance was needed most: recycling allocation, transportation logistics, maturation of distilled spirits, and cooling models.

Although this document is intended to accommodate enterprise inventory and beverage product carbon footprints (with the exception of dairy products), no guarantee is made on behalf of BIER members to complete or publicly report the results of such an assessment. In many cases, BIER members have decided to approach enterprise or product GHG emissions in several phases, to identify areas for improvement or clarification. This will also allow companies to focus their efforts on certain portions of the value chain before moving on to a more complete assessment.

ACKNOWLEDGEMENTS

This Beverage Industry Sector Guidance document was developed through a collaborative effort of BIER. The global beverage companies which participate in BIER have developed this protocol in an effort to better understand the GHG emissions associated with our industry. This work product supports BIER's mission of establishing a common framework for stewardship in the realm of energy efficiency and climate change mitigation.

BIER would like to thank the authors of the "Greenhouse Gas Accounting Protocol for the International Wine Industry" for sharing their document with us. Without their guidance, and the lessons learned from their experiences, our task of creating our own protocol would have been more difficult. In addition, we would like to thank the World Resources Institute, the Scotch Whisky Association/Scotch Whisky Research Institute, the Carbon Disclosure Project and the Carbon Trust for reviewing earlier drafts of this document and providing substantive feedback which has enabled us to produce a stronger, more useful document better aligned with existing protocols.

Introduction

As the issue of climate change advances on the list of global priorities, businesses must develop strategies to reduce their greenhouse gas (GHG) emissions. For the beverage industry, as for all industries, a critical first step in reduction efforts is to properly inventory all GHG emissions associated with a company and its value chain, as well as the GHG emissions associated with the life cycles of its products. The beverage industry can be proactive by inventorying and reporting GHG emissions in a way that will help to meet growing demands from key organizations and stakeholders, such as:

- *Governments* that seek to regulate and provide incentives for businesses to reduce their GHG footprints.

- *Influential beverage customers* that have begun to engage their suppliers for GHG emissions accounting.

- *Individual consumers* who are increasingly aware of the environmental impacts of the products they purchase and of the businesses that provide them. Consumers can choose, and are choosing, to buy environmentally-friendly products, and to avoid companies that are less sensitive to reducing their environmental footprint.[1]

It is the Beverage Industry Environmental Roundtable's (BIER's) position that disjointed efforts by individual companies may lead to complications later on, such as competing or incompatible methodologies; accounting practices not aligned with emerging legislation; the inability of the industry to influence emerging regulation; and/or confusing and potentially misleading product carbon labels. Therefore, the work to write this guidance represents a united approach to measuring and reporting GHG emissions and the industry's intent to play a constructive role in reducing GHG emissions.

It should be noted, however, that while the *Beverage Industry Sector Guidance for Greenhouse Gas Emissions Reporting* allows for a consistent approach to identifying life cycle impacts, this guidance is not designed to be used to directly compare products.

The *Beverage Industry Sector Guidance for Greenhouse Gas Emissions Reporting* is the result of a year-long collaborative effort of BIER, whose membership includes representatives from the beverage alcohol, brewing, and non-alcoholic beverage sectors (includes all beverages except dairy). BIER members have drawn primarily from two documents representing the current methodologies for estimating carbon footprints in developing this protocol: *The Greenhouse Gas Protocol* (written by the World Business Council for Sustainable Development [WBCSD] and World Resources Institute [WRI]), and the *Publicly Available Specification 2050* (PAS 2050) (prepared by the British Standards Institution [BSI] and co-sponsored by the Carbon Trust and the Department for Environment, Food and Rural Affairs [DEFRA]). Because ISO14040 and ISO14044 are foundations for PAS 2050, they are they are, by default, foundations for the product carbon footprint portions of this guidance.

The purpose of the *Beverage Industry Sector Guidance for Greenhouse Gas Emissions Reporting* is to provide beverage industry-specific information and examples that support the requirements of aforementioned GHG reporting protocols. Companies within the beverage industry seeking to report GHG emissions either at the enterprise or product level can use this Sector Guidance to: 1) improve their understanding of the requirements of the Protocol(s) by working through examples specific to beverage operations; and 2) validate results of analyses performed. Although complete enterprise-level reporting includes all operations or divisions of an organization (which may include media, entertainment, or foods), this sector guidance addresses only the beverage-related operations. Further clarification of any of the issues brought up for discussion in this Sector Guidance may be found in *The GHG Protocol* and/or the *PAS 2050*, as this document is only meant to supplement or clarify existing protocols.

The *Beverage Industry Sector Guidance for Greenhouse Gas Emissions Reporting* is organized as follows:

- Section 1, Alignment with Recognized Protocols
  Reviews the major protocols and evaluates their application to the beverage industry.
- Section 2, Enterprise Inventory Approach
  Defines boundaries, activities, and calculation methods relating to the calculation of an enterprise inventory of GHG emissions.
- Section 3, Product Carbon Footprint Approach
  Defines boundaries, activities, and calculation methods relating to the calculation of a product carbon footprint.
- Section 4, Data Reporting
  Provides data reporting guidelines with emphasis on the calibration of reports to ensure industry consistency.
- Section 5, Base Year Emissions
  Provides guidelines for establishing a base year and reviews factors that trigger a base year recalculation.
- Section 6, Endnotes
- Section 7, References
- Section 8, Glossary

As a final note, this is a "living document." As GHG data collection, estimation and reporting guidelines continue to evolve, we expect protocols and standards to develop concurrently, and at a rapid pace.

The *GHG Protocol* and *PAS 2050* protocols are likely to become more complementary, as WRI/WBCSD have begun work on a Scope 3 Accounting and Reporting Standard as well as a Product Life Cycle Accounting and Reporting standard that is expected to share many elements with *PAS 2050*.[2] As these new standards, as well as other ISO standards, become final, the beverage industry will respond with updates to this Sector Guidance document as needed.

1. Alignment With Recognized Protocols

There are two primary protocols in the field of GHG emissions reporting: the GHG Protocol (for enterprise-level reporting) and PAS 2050 (for product carbon footprinting). As with The GHG Protocol, the *Beverage Industry Sector Guidance for Greenhouse Gas Emissions Reporting* is intended to be used to estimate emissions of the six primary GHGs (CO_2, CH_4, N_2O, SF_6, HFCs, and PFCs) either individually or collectively in terms of carbon dioxide equivalent (CO_2e). Strict adherence to PAS 2050 requires inclusion of several other classes of GHGs, including those addressed in the Montreal Protocol such as fluorinated ethers, perfluoroethers, and certain other hydrocarbons.[3] Whether a company should include certain GHGs in a given report will be determined by the requirements of each reporting program.

APPROACHES TO EMISSIONS ESTIMATION AND REPORTING

There are two unique approaches to GHG emissions estimation and reporting: enterprise reporting and product-level reporting. The Sector Guidance document intends to prescribe standard boundary conditions and data sources specific to the beverage industry, where flexibility exists within these two approaches.

Both enterprise inventory and product carbon footprint assessments use the beverage value chain as the basis for calculation. However, the difference in enterprise and product reporting is in how pieces of the value chain are considered, and in what proportions. An enterprise inventory includes all emissions from the reporting company over a given period of time, as well as the proportion of emissions from value chain partners that are associated with the reporting company's products. A product carbon footprint includes all emissions from across the value chain required to manufacture a given product, normalized to a functional unit. Each approach is presented below.

Enterprise Inventory

Enterprise reporting, as defined by The GHG Protocol, is arranged in a series of three "scopes", or emissions categories. Emissions included in an enterprise emissions calculation are for all products offered by the beverage company.

Scopes are defined as follows:

Scope 1: Direct GHG Emissions
Direct GHG emissions resulting from company operations (including generation of electricity, heat, or steam; physical or chemical processing; and fugitive emissions).
Scope 2: Electricity Indirect GHG Emissions
Electricity Indirect GHG Emissions resulting from the generation of purchased electricity, heat, or steam.
Scope 3: Other Indirect GHG Emissions
Other Indirect GHG Emissions associated with other functions of the value chain.

When reporting using the enterprise approach, companies must report Scopes 1 and 2. Reporting of either a portion or all of an enterprise's Scope 3 emissions is voluntary at this time. While the finer boundary points between scopes are discussed within this document, consider that for a certain beverage company all production, packaging, and warehousing operations are under the company's control. All upstream beverage ingredients and packaging are purchased from third-party suppliers; similarly the company uses an external distributor to pick up beverages from the warehouse and deliver their beverages to the point of sale.

Only the fraction of GHG emissions from upstream and downstream value chain partners that are associated with the materials, products, or services provided to the beverage company are included in enterprise Scope 3 emissions.

A company reporting emissions based on the enterprise approach might present emissions totals according to the following emissions categories:

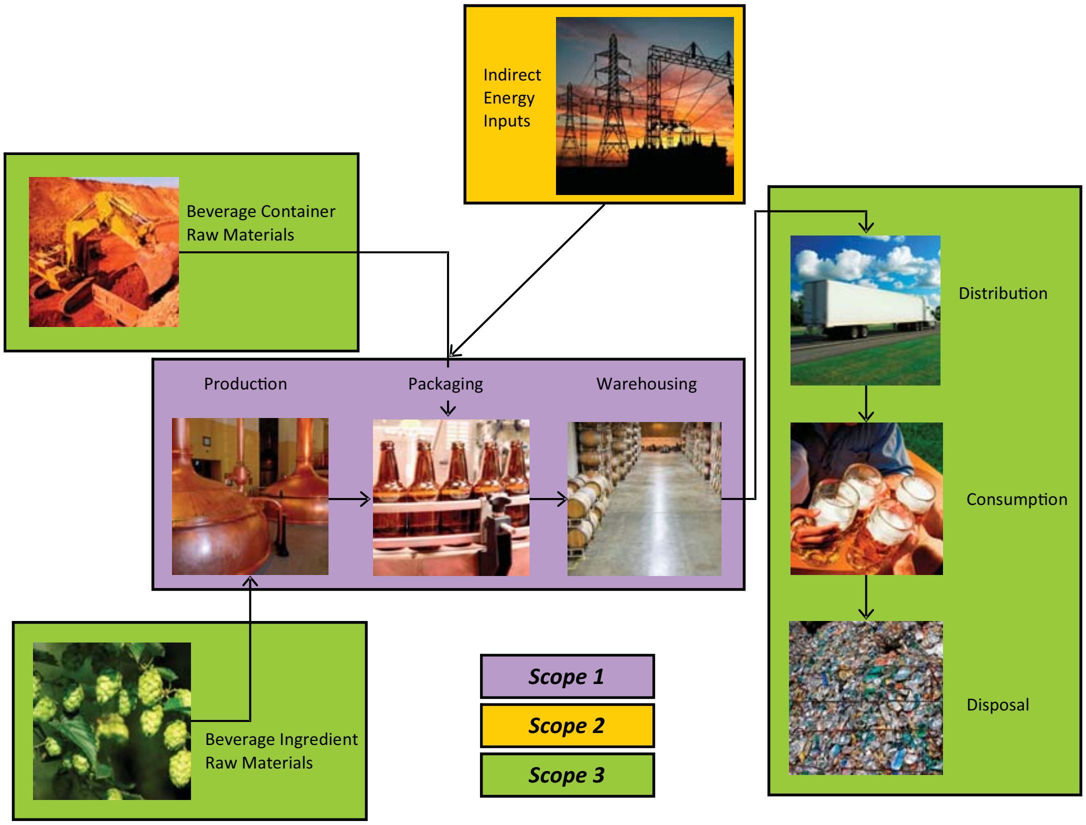


Figure 1. Scope Allocation of Beverage Industry Value Chain

Note: The boundary between scopes will be unique to each company, depending on its business operations. For example, if a company controlled its own distribution fleet, GHG emissions associated with product distribution would be included in the Scope 1 inventory.

Product Carbon Footprint

Product-level emission reporting, as presented in PAS 2050, requires a different evaluation of value chain emissions. For this approach, it is irrelevant whether GHG emissions are associated with company controlled operations or by another entity, direct or indirect. Instead, the carbon life cycle is defined for an individual product, and GHG emissions from across that life cycle are aggregated. Only the fraction of emissions from each value chain component that contributes to the specific product footprint is included in the product emissions total.

Although this document will commonly use the terminology “Product Carbon Footprint,” the same GHGs that contribute to an enterprise inventory also contribute to the product carbon footprint. GHGs other than CO_2 are expressed in terms of CO_2e using their global warming potential (GWP), such that the footprint of a product can be expressed as a single number.

For example, consider a beverage company with a single manufacturing location that makes two products: grape soda and lemon-lime soda. Emissions from the manufacturing location are allocated to the two products (as described later in this document). However, each product individually is not assigned the total emissions from that manufacturing location. Similarly, emissions from across the value chain are attributed to one of the two products. For example, all emissions associated with growing lemons and limes would be attributed to the lemon-lime soda; emissions associated with growing grapes would be attributed to the grape soda.

Product emissions are presented on a functional unit basis (per liter or per serving, for example). Also, there are other ways to define a "product" – for example, the beverage company could separately calculate product footprints for packaging grape soda in a 20 oz. PET bottle or 33cl aluminum can, using the same principles.

It is important to recognize that a product carbon footprint is different from a classic life cycle assessment (LCA). An LCA is a tool for quantifying the emissions, resources consumed, and environmental and health impacts associated with all stages of the life cycle of a product; a product carbon footprint focuses solely on GHG emissions within the same product life cycle.

Making Sense of Product and Enterprise Emissions

The end result of an enterprise emissions estimation and product-level assessment are quite different, but use the same data sources. Figure 2 below identifies how the beverage industry value chain or product life cycle is evaluated for an enterprise inventory or product carbon footprint, respectively.

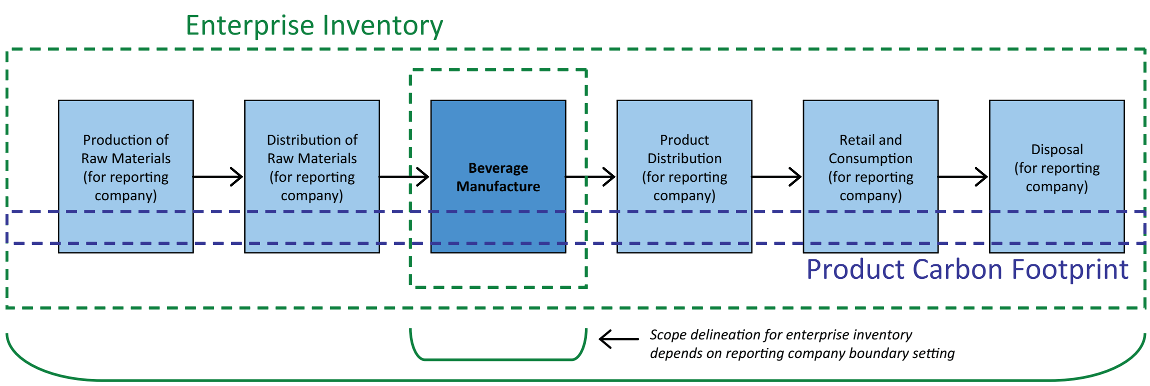


Figure 2. Enterprise Inventory and Product Carbon Footprint Comparison

All steps in the value chain, whether electricity used to cool a warehouse, fuel used in distribution trucks, or natural gas used in the manufacturing plant, have their place in each assessment. For that reason, this document intends to facilitate the use of either emissions approach, as beverage companies will ultimately require similar data to complete either approach.

2. Enterprise Inventory Approach

INTRODUCTION TO THE ENTERPRISE GHG INVENTORY

The enterprise inventory approach encompasses all GHGs emitted by a reporting entity across its value chain during a given time frame (most commonly over a one-year period).

For the beverage industry, Scope 1 and 2 reporting includes processing and packaging operations, and related activities that are under the operational control of the reporting company. Companies that operate businesses unrelated to beverages, for example entertainment, snacks or media businesses, and wish to assess these emissions, should refer to sector guidance specific to those industry sectors for reporting purposes.

Within The GHG Protocol, Scope 3 emissions are defined as the remaining emissions (after Scope 1 and 2 emissions have been accounted for) resulting from activities within the value chain of a company, and/or its products that are not under operational control. Examples from the beverage industry may include emissions from farming, mining, packaging material conversion, third-party distribution and sales, and other activities commonly supplied externally.

The reporting company must make efforts to report all GHG emissions within the chosen inventory boundary. The concept of a materiality threshold is discussed in Section 4, *Data Reporting: Verification, Material Discrepancies*, but in general does not represent a *de minimus* threshold for determining a complete inventory.

SETTING ORGANIZATIONAL BOUNDARIES

Use the **operational control approach** as defined by The GHG Protocol to define Scope 1 and 2 emissions. Table 1 lists examples to assist in determining types of operations that are under the control of the reporting company. Include all GHG emissions from operating facilities which are wholly owned and for which the company has operational control in its Scope 1 and 2 calculations. Emissions from non-beverage operations such as entertainment, media, or food businesses are not addressed within this Sector Guidance.

Operational Control Approach Inclusions and Exclusions	
Included for Scopes 1 and 2	**Excluded for Scopes 1 and 2**
• Company-owned operations or partially-owned joint ventures where the company has operational control. • Integrated operations such as container manufacturing, ingredient processing, or recycling operations that are under operational control. • Company operations that support licensees and franchises, such as quality control, marketing and other support functions. • All owned or leased office, headquarters and distribution buildings, properties, travel assets, and activities supporting beverage operations.	• Licensees and franchises, such as bottlers or distributors that are operated independently. • Incorporated and non-incorporated joint ventures or partnerships over which the reporting company does not have operational control. • Co-packing operations under co-packer ownership, and not controlled by the reporting company (specific example provided in Section 3, *Product Carbon Footprint Approach, Packaging*). • Co-sited suppliers where the supplier retains operational control, even when operations are located on the reporting company's property. For example, a PET supplier leasing space within the manufacturing operation of the reporting company is specifically excluded.

Table 1: Operational Control Approach Inclusions and Exclusions

Clearly state any deviation from the Scope 1 and 2 inclusions/exclusions listed above when reporting GHG emissions. For example, some beverage companies consistently report any franchised or licensed operations as part of the reporting company for environmental reporting purposes. A beverage company that elects to include GHG emissions associated with franchised and licensed operations (which are not controlled operations) under Scope 1 and Scope 2 is required to clearly state the deviation from the approach defined above.

SCOPE 1 BEVERAGE INDUSTRY EMISSIONS

Report GHG emissions from operationally controlled sources as Scope 1 emissions. These direct GHG emissions may result from the following non-exhaustive list of activities undertaken by the company, shown in Table 2. All sources need to be identified and quantified.

Primary data should be used to calculate Scope 1 emissions. Recommended sources of primary data are available in Appendix A, *Sources of Primary Data*.

EMISSIONS SOURCE	EXAMPLES AND NOTES
Boilers, Steam and Hot Water Generation Units	Industrial boilers. Fire tube and water tube boilers.
Co-generation Operations	Systems generating electricity and using exhaust for heating. Systems producing heat for industrial processes and using a recovery boiler to generate electricity. Combined heat and power (CHP). Reciprocating engines, combustion turbines, micro-turbines, backpressure steam systems and fuel cells.
Engines	Automotive, diesel, and natural gas engines. When using biofuels, include only non-CO_2 GHG emissions in the Scope 1 inventory. CO_2 emissions resulting from biomass combustion should be reported separately from Scope 1 emissions.
Flares	Flares associated with off-gassing from fermentation tanks, vaporizer blender systems, and wastewater treatment. Report CO_2 emissions from biomass flare combustion separately from Scope 1 emissions.
Fugitive Emissions	Report purchased CO_2, derived from fossil-based sources, that escapes or becomes fugitive during processing or cleaning. Include fugitive GHG emissions from refrigeration sources. Exclude CO_2 derived from in-house fermentation, as this is a biological carbon source. CO_2 emissions from biomass combustion or biogenic source decomposition must be reported separately from Scope 1 emissions.
Generators	Generators permanently operated under operational control, such as electrical power generators or turbines. Generators brought in for temporary/emergency use.

Table 2: Beverage Industry Scope 1 Emissions
(table continued on next page)

EMISSIONS SOURCE	EXAMPLES AND NOTES
Heaters/ Cooling Units	All heaters, dryers and cooling/refrigeration/cold storage equipment used for in-plant processing, sanitation, and employee comfort except those which use purchased electricity (these are captured under Scope 2).
Incinerators	Incinerators used to burn various materials and reduce waste load.
Pollution Control Equipment	Thermal or catalytic oxidizers; induced draft fans used to destroy volatile organic compounds. Emissions from these sources include CO_2, CH_4 and N_2O from fuel used to run them and any GHG produced by the breakdown of the pollutant. Biodigester for waste water treatment. Non-CO_2 emissions, such as CH_4, are included in the inventory. Any emissions not captured are included as fugitive emissions.
Transportation of Materials, Waste, & Employees	Corporate business travel in owned or leased travel assets such as company jets, company owned and leased employee vehicles, sales and merchandizing vehicles, rail engines, and trucks. Include all off-road vehicles such as forklifts, skid steers, yard boys, and rail mules. Include waste treatment under operational control.

Table 2: Beverage Industry Scope 1 Emissions (continued)

SCOPE 2 BEVERAGE INDUSTRY EMISSIONS

Beverage industry GHG emissions sources included under Scope 2 (indirect emissions) generally fall into one of the following two categories:

Emissions from directly purchased utilities such as electricity, steam, chilled water, refrigeration, or compressed air used at company-owned or controlled facilities must be reported within Scope 2 emissions.

When purchasing electricity, heat or steam from a CHP plant, it is necessary to allocate emissions generated according to the proportion of each stream purchased or sold. Use the efficiency method as defined in the WRI/WBCSD Protocol Initiative Calculation Tool to allocate emissions.[4] This method calculates GHG emissions according to the amount of fuel energy used to produce each final energy stream.

Emissions from indirectly purchased utilities at controlled facilities, such as the energy used to run leased buildings and operations within them, must be included. For leased buildings accounted for under this Sector Guidance, the preferred data sources are as follows: 1) actual metered usage from leased space; 2) percentage of actual metered usage for entire building based on percentage of building leased; and 3) U.S. Environmental Protection Agency's Commercial Building Energy Consumption (CBEC) tool.[5] Outside of the United States, companies choosing to use this EPA tool should substitute the energy emissions factor for the country in which the operation is located. The tool uses square footage and type of leased space to estimate energy consumption.

Energy which is claimed to be 'renewable' is not assumed to be a low GHG emissions source, unless the energy supplier can document, in the form of an accredited certificate, that no other process or product is claiming this emissions intensity (i.e. it is not contributing to average grid emissions intensities). Further, the beverage company must assure this low emissions source is not counted elsewhere in the product carbon footprint.

SCOPE 3 BEVERAGE INDUSTRY EMISSIONS

Scope 3 emissions include any emissions in the company's value chain not accounted for under Scopes 1 and 2. The distinction between scopes is unique to each beverage company depending on its operational boundaries. As stated previously, reporting of Scope 3 emissions is currently voluntary.

The topics identified in the following section all fall within Scope 3 for most beverage companies. Note that any items in the following subsections that are under the operational control of the company will count towards Scope 1 emissions; purchased energy associated with these activities would count towards Scope 2 emissions. The emissions included in the Scope 3 inventory should include the direct emissions (such as fuel combustion in a truck owned by a third-party distributor) and indirect emissions (such as electricity used during production of packaging materials) associated with these value chain activities.

Recommended data sources for estimating emissions are included in Appendix B, *Directory of Data Resources*.

Value Chain Overview

The company's Scope 3 emissions inventory encompasses all activities related to the generation, use, and disposal of the beverage products, their associated packaging and waste streams. Figure 3 highlights six key areas within the beverage life cycle whose emissions can be counted as Scope 3 emissions for the enterprise. For each value chain component, these emissions are included in the inventory based on the fraction associated with the beverage company's manufacturing and operations versus those total emissions associated with a particular supplier.

- Beverage ingredients: Includes emissions associated with production/treatment of water, and agricultural and chemical components (preservatives and sweeteners) used by the enterprise.
- Packaging materials: Includes emissions associated with production of primary, secondary, and tertiary packaging used by the enterprise.
- Beverage production and warehousing: Includes any beverage production and warehousing activities which are not under the operational control of the reporting company. Common examples are co-pack operations and distribution networks, unless they are wholly controlled by the beverage company.
- Retail, marketing and consumption: Includes the point-of-sale retailer, display cases, adware, refrigeration units, vending machines, restaurants, and end use by the consumer based on the proportion used by all enterprise products.
- Disposal, reuse and recycling: Includes emissions associated with the disposal of packaging and other waste streams generated throughout the value chain for all materials/processes relating to the enterprise's operations.
- Transportation and distribution: Include emissions generated as a result of transportation of all products, packaging materials, beverage ingredients, fuels, and wastes.

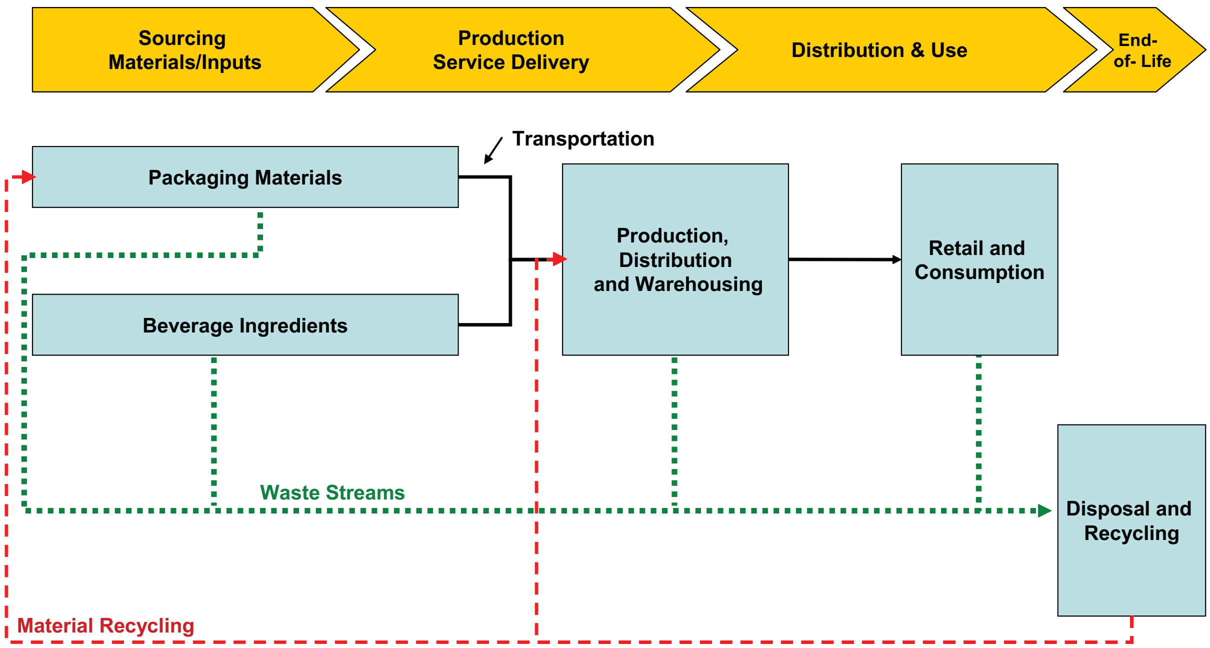


Figure 3: Simplified Beverage Product Value Chain

Details of contributing sources and boundary conditions for each Scope 3 topic are presented below.

Beverage Ingredients

Include all emissions associated with the growing, processing, and transportation of ingredients used in the company's products in the Scope 3 inventory. Examples include:

- Emissions associated with energy use by third-party agencies for extraction, transportation, and treatment of ingredient and process water.
- Emissions associated with the manufacture, transport and storage of chemical materials such as preservatives and other artificially synthesized flavors.
- Emissions resulting from agricultural processes, including tilling, planting, irrigating, harvesting, fertilizing, and transporting agricultural products used by the beverage industry.

Packaging

Include all GHG emissions associated with the production of the company's packaging materials in the Scope 3 inventory. Types of packaging include primary (e.g., the container enclosing the liquid, such as a bottle), secondary (e.g., a case of bottles/cans), and tertiary (e.g., a pallet of cases with shrink wrap that is prepared for transportation and storage).

GHG emissions estimates should include the initial extraction of the raw materials from the earth or forest (incorporating recycled stock). The inventory should include packaging materials for all products made by the company, as well as marketing materials such as game pieces, point-of-sale displays, or promotional items that are added to packages.

Beverage Production and Warehousing

For the beverage industry, the beverage production process will typically be accounted for as a Scope 1 activity. However, co-packing operations should be accounted for in the Scope 3 inventory when the reporting organization has no operational control over the production operation. For example, a brewing company may own and distribute a beer brand globally. However, in a specific location they contract with a third party to brew and package the same product, without assuming direct control over the operations of that brewery. The emissions associated with the third-party owned and controlled brewery would be accounted for as Scope 3 emissions. The same principles apply to joint ventures over which the reporting organization does not have operational control.

For instances where a co-packer produces beverages for more than one company, it is necessary for the reporting organization to estimate the portion of GHG emissions from the co-packer's facility which represents the fraction of their beverage versus all beverages produced at the third-party production facility.

GHG emissions from warehouses controlled by a third party which store a beverage company's products should also be included in the Scope 3 inventory, in proportion to the fraction of the warehouse occupied by the reporting company's products.

Retail and Consumption

GHG emissions are generated during the retail sale phase of products, as well as during the beverage end use by consumers. Emissions associated with cooling must be calculated for all beverages that are sold below ambient temperature at the point of sale, regardless of the manufacturer's recommended temperature of consumption.

GHG emissions associated with beverage retail and consumption that should be accounted for in the Scope 3 inventory include the following:

- Electricity used to run the cooler or vendor (potentially included in Scope 2 inventory; see Appendix C, *Guidance for Beverage Retail and Home Consumption* for details);
- GHG emissions from the production and losses of refrigerants used at retail or point-of-sale establishments;
- Purchased CO_2 used at retail establishments to run draft products or soda fountains;
- GHG emissions from the production of cups and other packaging materials used to consume draft products; and
- The energy used to heat and light the fraction of retail space where equipment is located (hotel load).

For further detail on this topic and calculation methods, see Appendix C, *Guidance for Beverage Retail and Home Consumption*.

Waste Disposal, Recycling and Reuse

Wastes and by-products are generated at each point in the beverage value chain. Include GHG emissions associated with the treatment, recycling, and/or disposal of all waste products generated by the beverage company. GHG emissions associated with waste disposal at other points in the value chain should also be included in the Scope 3 inventory.

GHG emissions associated with generation of by-products should be accounted for up to the point where the by-product can be beneficially reused.

Transportation

The Scope 3 inventory should include all GHG emissions associated with all transportation streams in the company value chain which are not controlled by the reporting company. Examples common to beverage companies include:

- Transportation of raw agricultural products to processing facilities;
- Transportation of all raw material inputs to the production facility, such as packaging materials, process chemicals, and beverage ingredients;
- Product distribution including direct delivery from retailer to consumer. Emissions from empty return journeys are included;
- Transportation of wastes to their final disposal location or point of beneficial reuse; and
- Employee business travel.

Include GHG emissions associated with refrigeration use in transport.

Common forms of transport used in the beverage value chain include locomotives, passenger vehicles, trucks, planes, and cargo ships and barges.

Published emissions factors may be used in calculating transportation-related emissions. [6, 7]

Additional guidance on transportation logistics and product distribution is included as Appendix D, *Transportation Logistics and Product Distribution*.

Energy

The Scope 3 inventory includes all energy inputs used by value chain providers. For example, the GHG emissions from a cardboard box manufacturing operation should include both electricity used by the cardboard box manufacturer, as well as any on-site fuel combustion or process emissions associated with the operation. The reporting company accounts for GHG emissions in a proportion equal to the fraction of boxes manufactured for the beverage company.

Many energy suppliers are offering a "green tariff," or energy from renewable sources sold at an additional cost. Energy which is claimed to be 'renewable' is not assumed to be a low GHG emissions source, unless the energy supplier can document, in the form of an accredited certificate, that no other process or product is claiming this emissions intensity (i.e., it is not contributing to average grid emissions intensities). Further, the beverage company must assure this low emissions source is not counted elsewhere in the product carbon footprint.

AGGREGATION AND APPORTIONMENT OF EMISSIONS

An enterprise inventory is typically created through the aggregation of emissions from various facilities, activities, and value chain components. For example, a given manufacturing facility can calculate its Scope 1 emissions using the same principles described above, and the manufacturing emissions inventory for an enterprise can be determined by aggregating emissions from all manufacturing locations.

Further description of aggregation methods can be found in Appendix E, *Aggregation and Apportionment of Emissions*.

REPORTING THE ENTERPRISE INVENTORY

When reporting an enterprise inventory, the reporting company must report the complete inventory of Scope 1 and 2 emissions. The beverage company has several options regarding Scope 3 emissions:

- The company can elect to omit Scope 3 emissions from its inventory.
- The company can elect to report Scope 3 emissions only from first-tier suppliers, rather than complete Scope 3 emissions from material extraction through end-of-life.
- The company can report the largest categories of Scope 3 emissions, such that the reported Scope 3 inventory accounts for a certain percentage of the total anticipated Scope 3 emissions inventory.
- The company may report all Scope 3 emissions.

The reporting company should be clear in the approach taken to reporting Scope 3 emissions.

Full reporting requirements are presented in Section 4, *Data Reporting*.

> *Note: Future versions of this guidance may contain additional standardized reporting requirements for beverage industry enterprise inventory emissions reporting.*

3. Product Carbon Footprint Approach

INTRODUCTION TO PRODUCT CARBON FOOTPRINTING

A product carbon footprint is an evaluation of GHG emissions across the life cycle of a product. Unlike an enterprise-based assessment, boundaries are not drawn within the value chain to assign emissions to scopes. Instead, all emissions within the value chain boundary of a specific product are accounted for and parceled to a functional unit, which could be a specific container, serving size, or case of product.

The areas of the value chain are the same as those described above for enterprise reporting, and include the GHG emissions associated with raw material inputs, transportation streams, manufacturing, and disposal/recycling of beverage materials. Aggregated GHG emissions from all activities related to a product from the extraction of basic raw materials, through manufacturing and distribution and including consumer use and end of life (recycling/disposal), are included in the product carbon footprint.

The sections below describe how emissions from various portions of the value chain are to be allocated.

BEVERAGE INGREDIENTS

Account for the GHG emissions associated with the growing, manufacturing, or processing of all ingredients used to make the beverage product, including the following:

Energy required for extraction, transportation, and treatment of ingredient and process water.

> <u>Example</u>: A company uses water from surface, ground and municipal sources to manufacture its products. For surface and groundwater sources managed by the company, energy used to run the pump and convey the well or lake water would be included in the manufacturing energy consumption. For municipal or third-party supplied water, account for GHG emissions associated with the energy use for extracting, treating, and conveying the water to end users, normalized by the volume of incoming water, such that a certain amount of GHG emissions are associated with each liter of incoming water. Allocate these emissions to a unit of finished product, taking into account the efficiency of the production facility (i.e., water use ratio).

Energy required to manufacture, transport and store chemical materials such as preservatives and other artificially synthesized flavors and any other associated GHG, including purchased CO_2 from fossil-based fuels.

Example: A company uses artificial sweeteners and preservatives in its product. Obtain the GHG emissions associated with energy inputs and the materials used to produce these sweeteners and preservatives from the supplier, or use the best available secondary data for that industry. Emissions are also calculated for transport of these synthetic ingredients to the beverage manufacturing plant.

Example: A company purchases CO_2 to carbonate beverages from a fertilizer manufacturer. CO_2 is a by-product for the fertilizer manufacturer. Emissions are either quantified based on GHG emissions associated with the co-products or, if these data are not available, emissions are allocated in proportion to the economic value of the co-products. Account for energy required to manufacture the CO_2, and to transport the CO_2 from the beverage manufacturing facility.

Energy and any other associated GHG resulting from agricultural processes. Examples include fruits, barley and other grains, hops, milk, natural flavors and sweeteners.

Example: A distiller's controlled operations begin with fermenting processed grains. To fully account for the product's footprint, account for emissions from agricultural production and processing of grain. This will include N_2O and CH_4 emissions directly from the soil, emissions from vehicles/equipment used for field preparation, planting and harvesting of the grains. Also account for GHG emissions associated with transportation streams, such as transporting the grains to processing locations, and subsequently to the distillery. Finally, account for any GHG emissions associated with grain processing operations.

A partial list of beverage ingredients to consider for inclusion in the product carbon footprint is provided in Figure 4, Beverage Ingredients in the Product Life Cycle.

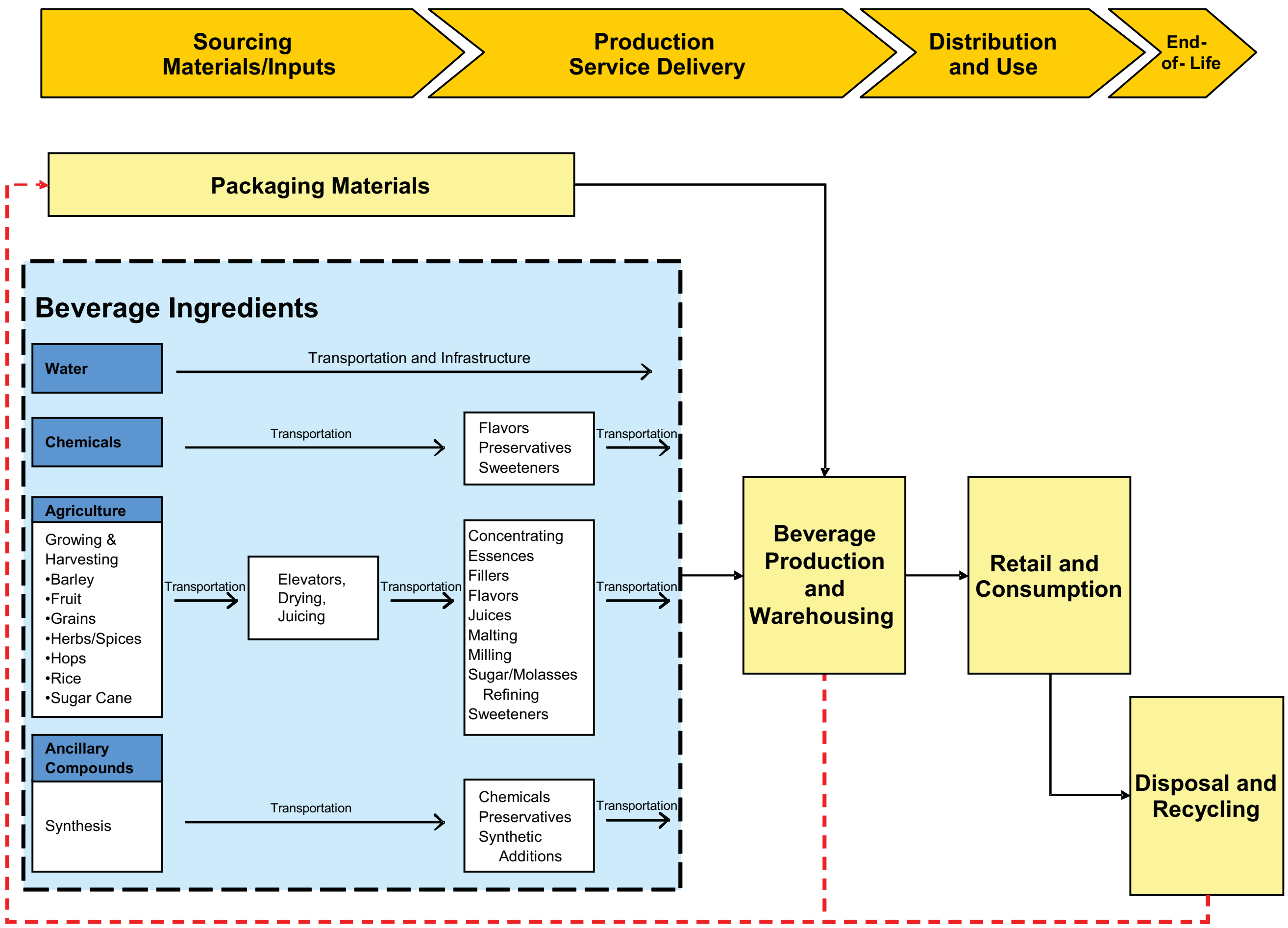


Figure 4: Beverage Ingredients in the Product Life Cycle

NOTE: Lists in boxes are not exhaustive.

PACKAGING

A product carbon footprint is typically calculated based on a specific package configuration, such as a six pack of beer, or a 1.5L bottle of mineral water. A variety of materials including plastic, glass, metals, and forest products are used for the different package types. GHG emissions generated from the production and use of each of these materials must be accounted for from their initial extraction from the earth or forest (incorporating recycled stock), through to the disposal, recycling, reuse and energy/materials recovery stages in the material's life cycle.

For each product carbon footprint, include the GHG emissions associated with production of primary (e.g., the container enclosing the liquid and affixed labels), secondary (a case of bottles/cans), and tertiary (a pallet of cases with shrink wrap that is prepared for transportation and storage) packaging. In certain sectors of the beverage industry, other packaging containers may be used during the product life cycle for aging (e.g., barrels). Where barrels or other packaging materials are reusable, their associated embedded carbon can be amortized over several life cycles.

In addition, include the GHG emissions resulting from the life cycle of other materials that may be added to packages, such as game pieces or other promotional items.

A partial list of packaging materials to consider for inclusion in the product carbon footprint is provided in Figure 5, Packaging Materials in the Product Life Cycle.

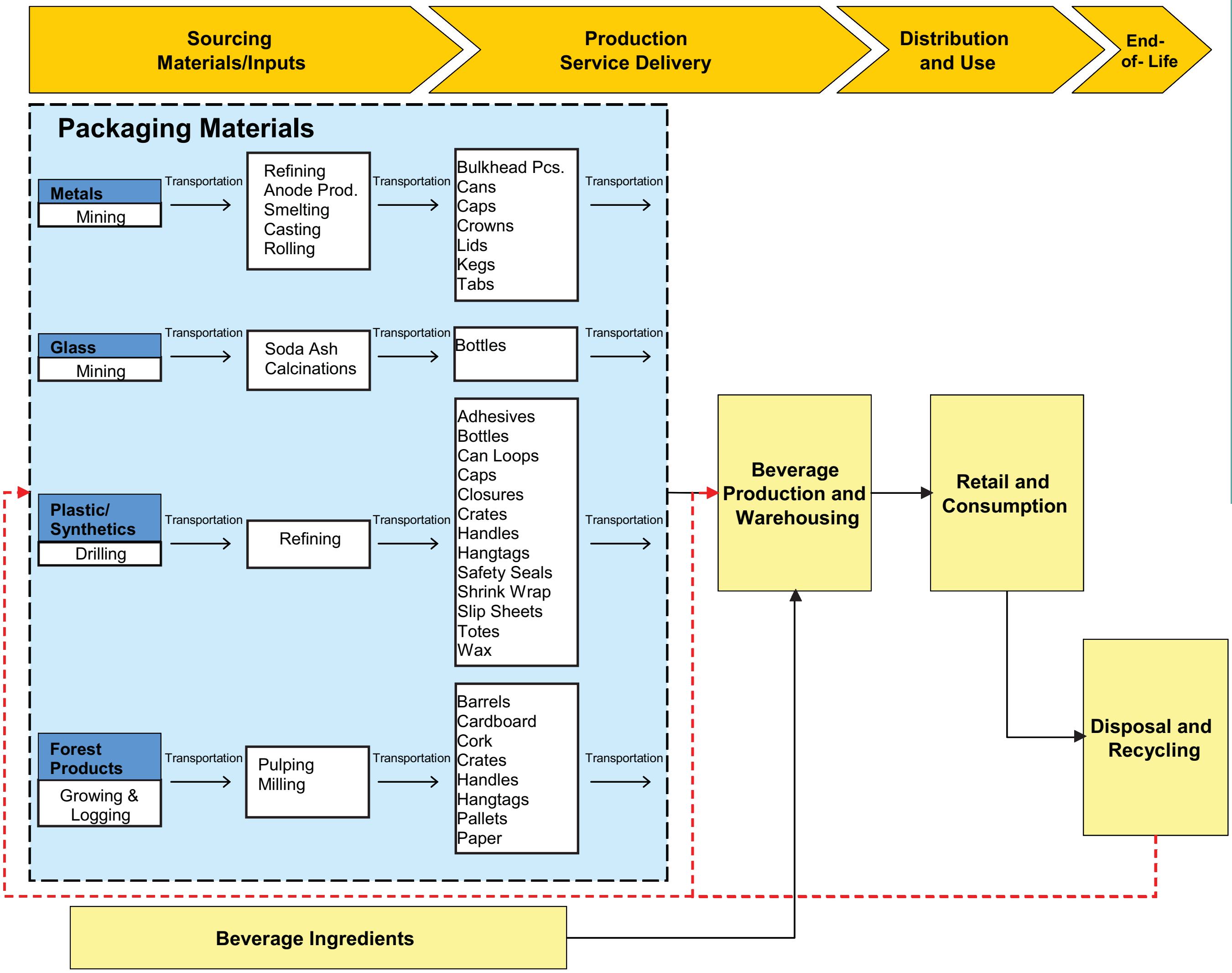


Figure 5: Packaging Materials in the Product Life Cycle

NOTE: Lists in boxes are not exhaustive.

BEVERAGE PRODUCTION AND WAREHOUSING

Account for emissions from the manufacture of the beverage product. The method of emissions allocation will depend on the level of detailed data available. At a minimum, manufacturing emissions should include all processes conducted to make the beverage (such as malting, fermentation, cooking, blending), emissions associated with bottling the product, emissions associated with packaging the product, and "hotel load" emissions associated with lighting and temperature control of the workspace. While some locations will have energy consumption data available for individual bottling lines, a more common approach is to normalize annual emissions from the manufacturing location by the volume of finished beverage produced at that location.

Beverage Alcohol Production Considerations

For some beverage alcohol products, including spirits, wines, and even beers, maturation is part of the beverage production process. Certain beverages, such as Scotch whisky, require years to fully mature before they are bottled for sale (maturation periods of over 10 years are common). During this time, the unfinished beverage is stored, usually in barrels and virtually untouched, until the maturation period is complete and the material is bottled.

The maturation process has significant implications for product carbon footprints, as certain steps in the product life cycle are completed many years before consumer use and end-of-life.

Account for GHG emissions associated with all processes up to the point of bottling as they occur in the year in which the product's carbon footprint reporting occurs. For example, if a 10-year-old Scotch whisky is bottled in 2008, emissions relating to growing of cereals during 2008 and emissions relating to distilling in 2008 would be used in addition to those from bottling and distribution. This approach affords several benefits:

- Primary data collected from company assets and value chain partners during a given year is used to calculate the product carbon footprint.
- Beverage companies can make decisions in their upstream value chain that will have an immediate impact, rather than waiting years for these improvements to be reflected in a product footprint.
- The approach supports the spirit of GHG reporting which is to promote transparency and drive improvements in environmental performance. In this way, the manufacturer becomes accountable for the environmental impacts of their product in the present day, rather than for those that occurred years before and over which they now have no control.

Another issue arising from the maturation process is that ethanol is lost to evaporation (commonly referred to as the "angels' share"). The final volume of product is often much less than the volume at the beginning of the maturation period. In lieu of primary data for loss percentages, apply an average annual loss to evaporation for the product and apply this loss factor to the total GHG emissions of the product up to and including distillation.

Beverage alcohol products may be blends from multiple producers (e.g., blended Scotch whisky), multiple product types (e.g., a liquor that uses both a grain neutral spirit and a wine), or products that have matured for different periods of time (e.g., Kentucky bourbon). For further detail on each of these, please see Appendix F, *Beverage Alcohol Guidance*.

RETAIL AND CONSUMPTION

GHG emissions are generated during the retail sale phase of the product life cycle as well as during the beverage end use by consumers. For all beverages that are sold below ambient temperature at the point of sale, emissions associated with cooling must be calculated, regardless of the manufacturer's recommended temperature of consumption.

Before certain beverages reach their point of sale, they are stored in temperature controlled storage units. Account for GHG emissions from the production of refrigerants used at retail or point-of-sale establishments, as well as purchased CO_2 used at retail establishments to run draft products and soda fountains.

Other GHG emissions that result from the beverage retail product include those from energy used to run the cooler/vendor; fugitive refrigerant emissions; and the energy used to heat and light the fraction of retail space where equipment is located (hotel load). Account for a share of the emissions generated equal to the volume-share and number of days of product in the refrigeration unit where a company's products make up only a portion of the refrigeration unit or cooler contents.

Estimates for domestic refrigeration shall be used for the beverage life cycle as each beverage will be stored in different ways.

For further detail on this section, see Appendix C, *Guidance for Beverage Retail and Home Consumption*.

WASTE DISPOSAL, RECYCLING AND REUSE

Wastes and by-products are generated at each point in the beverage life cycle. The transportation of wastes must be considered at each point up to and including the ultimate disposal location. For example, if waste is taken to a consolidation facility prior to being landfilled, account for GHG emissions from the additional transportation from the consolidation facility to the landfill. GHG emissions associated with the incineration or landfilling of wastes are also included in the product carbon footprint.

The beverage production process also generates a number of by-products which are often beneficially reused, such as bagasse, pumice, spent grains, spilled product, and wastewater.

Account for "waste products" that become co-products by virtue of them having a beneficial use (such as composting or feed material) up to the point of product differentiation. For example, if spent grains from beer production are sold for cattle feed, the emissions from the processing of the grains at the time they become spent are allocated based on economic value of the two products - that is, the spent grain and the beer. Another example is in the manufacture of orange juice; the oranges are squeezed to make juice and the peels are then sold for cattle feed. Any emissions associated with the peels are allocated based on the economic value of the juice and the cattle feed. Any emissions associated with transporting or further processing of that co-product are allocated to the co-product and not the original product from which it was derived.

Evaluate wastewater streams coming from a beverage production facility or other locations in the life cycle to identify the energy demand associated with wastewater treatment. For example, non-contact cooling water will require significantly less energy to treat than wastewater streams leaving fermentation process areas. In some cases, wastewater treatment will be performed at a company-controlled facility, and the purchased energy used in wastewater treatment is considered a Scope 2 emission. However, when wastewater is sent off site to a third-party treatment site, such as publicly-owned treatment works, include the energy use associated with transportation and treatment in Scope 3 emissions.

In the case of materials which are recycled for reuse in another product's life cycle (such as PET, which may be used in future PET bottles or for another use), use an allocation method based on the market recycling rate. Depending on local market conditions, this approach affords the environmental benefits of recycling either to the recyclers or to the beverage producer.

Details into recycling allocation methods are provided in Appendix G, *Allocation of Environmental Benefits of Collection and Recycling Materials*.

TRANSPORTATION

Account for GHG emissions associated with transportation at all portions of the beverage life cycle. The transportation of all beverage materials, packaging materials, and finished products should be accounted for from the point of extraction to disposal or recycling. Transportation emissions should be allocated to products based on the share of the cargo load; the basis for allocation (by weight, volume, or economic value) should be clearly stated by the beverage company.

Additional guidance on transportation logistics and product distribution is included as Appendix D, *Transportation Logistics and Product Distribution*.

ENERGY

GHG emissions result from purchased energy that contributes to all phases of the product life cycle including raw materials processing, packaging production, and fuels and other inputs (such as water) which are transported through fixed or permanent infrastructure (such as the energy required to pump water from a municipal treatment plant to the production facility).

Emissions factors used throughout the product footprint calculation should account for all fuels (including bio-fuels) consumed throughout the value chain. In addition, account for emissions generated during the extraction, production, and transportation of fuels that are then used to generate electricity throughout the product life cycle. It is expected that emission factors will be used to account for energy consumption through the value chain including extraction, production, and transmission/ distribution loss.

Many energy suppliers are offering a "green tariff," or energy from renewable sources sold at an additional cost. Energy which is claimed to be 'renewable' is not assumed to be a low GHG emissions source, unless the energy supplier can document the energy source with a REGO (Renewable Energy Guarantee of Origin) or accredited certificate.

EXCLUSIONS

GHG emissions that can be excluded from the organizational boundary for product carbon footprints are outlined in PAS 2050[8]. If any additional emissions are excluded, clearly state rationale when reporting results.

DE MINIMUS USAGE

Any GHG emission source when evaluated in terms of CO_2e representing less than 1% of the total GHG emissions emitted during a product life cycle are considered *de minimus* (as per material contribution determination in PAS 2050)[9].

Any such source can be removed from that product life cycle after using GHG emission data to demonstrate that the source meets this definition. However, when aggregated, if *de minimus* sources exceed the 5% materiality threshold, they shall then be included as they are no longer *de minimus*.

All *de minimus* emissions excluded by a member company must be declared.

REPORTING THE PRODUCT CARBON FOOTPRINT

As stated previously, companies reporting product carbon footprints must be transparent in disclosing any exclusions from the organizational boundary used in calculating the footprint, as well as any emissions sources determined to be de minimus. Full reporting requirements are presented in Section 4, *Data Reporting*.

Note: Future versions of this guidance may contain additional standardized reporting requirements for beverage industry product carbon footprint emissions reporting.

4. Data Reporting

This section outlines the data reporting requirements applicable to any company seeking to publicly claim compliance with this Sector Guidance.

DATA TRANSPARENCY

As the intention of this Sector Guidance is to achieve a common methodology for the beverage industry to account for and report GHG emissions, it is critical that companies are transparent in their reporting. Transparency includes describing any exceptions to this guidance, as well as how the reporting company's organizational structure impacts its ability to collect emissions data.

Alignment with Sector Guidance

Any company electing to publicly report GHG emissions in accordance with this Sector Guidance document must clearly state this in its report. Clearly document and explain each deviation from this guidance.

Boundaries

Clearly state organizational and operational boundaries. Present any changes in organizational boundaries or operational boundaries (due to acquisitions/divestitures, for example) to aid in a clear understanding of to year-to-year performance changes.

Data Source Limitations

Clearly list any data limitations and, if data are excluded, then state the reasons for excluding.

Purchase/Sale of Carbon Offsets

Report and fully disclose the purchase or sale of any carbon offsets/renewable energy certificates (REC) separately from emissions calculations. This Sector Guidance requires full reporting of emissions independently from any purchased offsets. The inventory must reflect both sold and purchased offsets. Add back sold offsets into the inventory. Track purchased offsets separately and do not show them as a reduction in a company's corporate inventory.

DATA VERIFICATION

This Sector Guidance recommends several methods of data verification be completed to ensure that reported GHG emissions values are representative of actual conditions. Although not required, recommended verification steps are described below.

Recordkeeping Requirements

Maintain records of emissions calculations and data sources used in a manner that facilitates review by a third party. Document both primary and secondary data sources.

Internal Verification

Prior to going to a third party for verification, conduct internal verification of the GHG emissions estimation process. Internal verification will not necessarily increase credibility of reported data, but is a useful tool to raise awareness of GHG emissions within an organization and identify shortcomings in data collection activities prior to engaging a third-party verifier.

Third-Party Verification

Companies reporting emissions are encouraged, but not required, to conduct an objective third-party verification audit of reported GHG emissions. Verification by a third party increases the credibility of publicly reported emissions estimates as well as supports the establishment and acceptance of this document as the industry standard. Certain agencies and initiatives, including The Climate Registry[10], World Economic Forum Global GHG Registry[11], and the European Union Emissions Trading Scheme[12] already require a form of emissions verification.

Material Discrepancies

Any verification activity, whether internal or external, should seek to identify material discrepancy, such as oversight, omission, or miscalculation, which leads to error in the formulation of an emissions footprint. A threshold of ±5% should be used to determine whether a discrepancy be considered "material" (as per The Climate Registry[13]). Material discrepancies can take the form of a miscalculation, inability of management or sites to obtain GHG data, or unreliability of data collection sources (e.g., outdated meters). Any material discrepancies that cannot be resolved prior to publishing an emissions report must be clearly stated in the report. Material discrepancies do not include the margin of error associated with secondary data sources.

Reporting Requirements

We recognize that reporting formats may vary based on the program for which data are reported. State any deviations from the *Beverage Industry Sector Guidance for Greenhouse Gas Emissions Reporting* when referencing it in reports.

Clearly state all internal and external verification efforts along with the statement and signature of the person(s) responsible for the verification process.

5. Base Year Emissions

This section details rules for choosing and recalculating base year emissions.

SELECTING A BASE YEAR

When developing an enterprise-level footprint, select a fixed base year. The base year should be the earliest year that the company has reliable data for its operations. Selection of a single base year (as opposed to a "rolling base year" approach, as defined in The GHG Protocol) has the advantage of allowing emissions data to be compared on a like-with-like basis over a longer time period. Use a fixed base year for enterprise-level reporting. For product-level reporting, a fixed or rolling year may be used depending on the goal of the calculation and reporting (change from a specific period of time, or annualized changes in footprint).

RECALCULATING BASE YEARS

Retroactively recalculate base year emissions to reflect changes in the company that would otherwise compromise the consistency and relevance of the reported GHG emissions information. Recalculating base years is critical for evaluating a company's performance over a given time period, and helps account for changes such as divestitures, acquisitions, and other structural changes. (See Example 1, *Recalculating Base Year Due to Acquisition*.)

Base year recalculation primarily applies when reporting GHG emissions on an enterprise level (i.e., when using the Scope approach established in The GHG Protocol). Certain changes, such as an improvement in data quality, may necessitate a recalculation of base year emissions for a product carbon footprint.

Always document the company's decision regarding recalculation and why it was made. This will help set precedent for future decisions and allow easy communication with external stakeholders or verification firms.

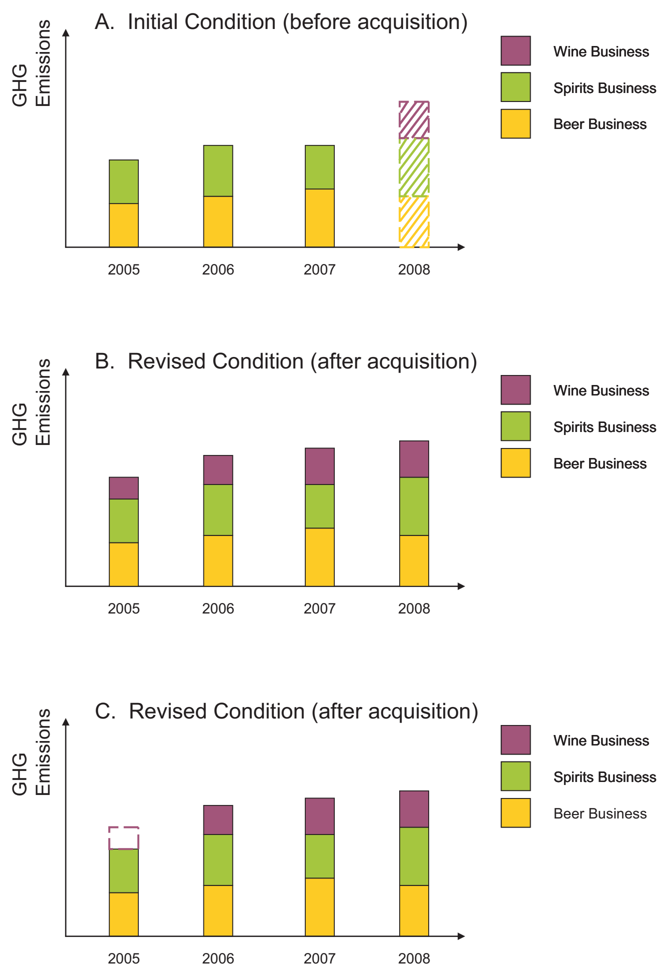
Further guidance on recalculating base year emissions is provided as Appendix H, *Base Year Recalculation Guidance Tool*.

Example 1 – Recalculating Base Year Due to Acquisition

A beverage company has historically operated two business units: Beer and Spirits. The company has selected a base year of 2005 and publicly reports its emissions in its annual report. In late 2007, the company acquires a Wine Business Unit. The Wine business would need to be added to the 2008 emissions reporting (Graph A).

However, because the Wine Business Unit represents a change in business structure greater than 5% of total emissions, previous years must be recalculated to account for these emissions and show a more transparent trend in carbon emissions over time (Graph B).

The exception to this condition would be if the Wine Business Unit came into existence later than the base year selected by the beverage company. Graph C shows an example where the Wine Business unit came into existence in 2005, with the first full year of data available in 2006. An outline of the data in 2005 denotes that no emissions with Wine are included in 2005 on the basis that the Wine business did not exist at that time.



Determinations regarding the type of structural changes and the significance of such changes are defined in the sections that follow. As a rule, the determinations below apply whether a company has a relative increase or decrease in emissions.

Significance of Changes

Recalculate base year emissions if a change in organizational structure or data quality exceeds a significance threshold of ±5% of base year emissions (as per material threshold in this section). Organizations must clearly reference this threshold when reporting any recalculated data sets. Organizations must also clearly articulate the basis and context for recalculations in any publicly reported emissions materials.

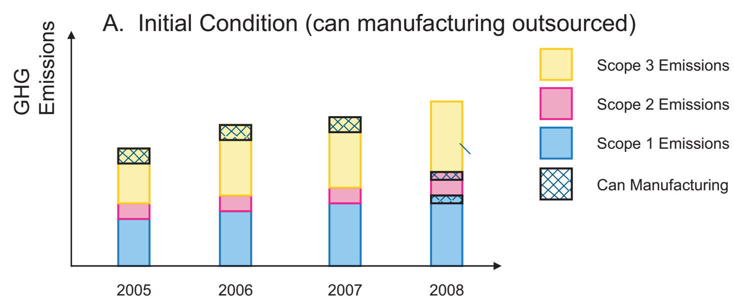
Outsourcing and Insourcing of Emitting Activities

Structural changes due to "outsourcing" or "insourcing" do not trigger base year emissions recalculations if the company is reporting its indirect emissions from relevant outsourced or insourced activities. However, if a company is only reporting its controlled operations (Scopes 1 and 2) and the change in sourcing causes a significant (±5%) change in enterprise emissions, recalculate base year emissions. Example 2 demonstrates when recalculation is required.

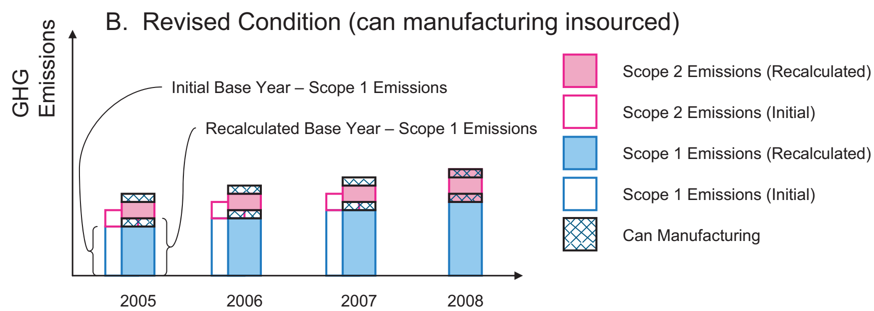
Example 2 – Recalculating Base Year Due to Sourcing Change

A beverage company has selected a base year of 2005 and historically purchases all of its cans from a third-party manufacturer. Toward the end of 2007, the company purchases the can manufacturer. Note that this purchase represents a shift in the scope where can manufacturing is accounted: historically, can manufacturing was a Scope 3 activity since it was owned by a third-party. Once acquired by the beverage company, emissions associated with the can manufacturing process fall under Scope 1 and the electricity purchased for use at can manufacturing facilities falls under Scope 2.

The need for a recalculation of base year emissions depends on the reporting method. If the company reports Scopes 1, 2, and 3 no recalculation of base year is required. The change in scope classification does not impact the overall emissions total (as shown in Graph A).



However, if the company only reports Scopes 1 and 2 (as is required by many reporting schemes), the acquisition of the can manufacturer would require a recalculation of base year emissions, as shown in Graph B below. This assumes that can manufacturing operations represent at least 5% of the previous base year emissions.



Discovery of Significant Errors

Discovery of significant errors, or a number of cumulative errors that meet the significance threshold, which are collectively significant, warrant a recalculation of base year emissions.

6. Endnotes

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[2] WRI/WBCSD GHG Protocol Product and Supply Chain GHG Accounting & Reporting Standard Business Plan, Draft for Public Comment, 23 May 2008. World Resources Institute/ World Business Council for Sustainable Development. Retrieved 10/10/2008 at http://www.ghgprotocol.org/files/proposed-business-plan.pdf.

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[4] WRI, WBCSD. Allocation of GHG Emissions from a Combined Heat and Power (CHP) Plant, Guide to calculation worksheets v1.0, September 2006.

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[6] California Climate Action Registry General Reporting Protocol: Appendix C: Calculation References. California Climate Action Registry. Version 3.0, April 2008. Retrieved 15 October 2008 at http://www.climateregistry.org/resources/docs/protocols/grp/GRP_V3_April2008_FINAL.pdf.

[7] 2008 Guidelines to DEFRA's GHG Conversion Factors: Methodology Paper for Transport Emission Factors. Department for Environment, Food, and Rural Affairs. July 2008. Retrieved 15 October 2008 at http://www.defra.gov.uk/environment/business/envrp/pdf/passenger-transport.pdf.

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[9] PAS 2050, Section 3.33.

[10] The Climate Registry General Reporting Protocol: Version 1.1. May 2008. The Climate Registry. Retrieved 12 August 2008 at http://www.theclimateregistry.org/downloads/GRP.pdf.

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[12] Verification Protocol v2.0: Verification of Annual Emission Reports of installations engaged in EU emissions trading. 2005. International Emissions Trading Association. Retrieved 10 October 2008 at http://www.ieta.org/ieta/www/pages/getfile.php?docID=1153.

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2. Chapter 5: Tracking Emissions Over Time. Climate Leaders Design Principle Guidelines. United States Environmental Protection Agency. Retrieved 25 January 2010 at http://www.epa.gov/climateleaders/resources/design-principles.html.

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6. Technical Guidelines: Voluntary reporting of Greenhouse Gas (1605(b)) Program. Office of Policy and International Affairs. United States Department of Energy. 1/2007. Retrieved on 12 August 2008 at http://www.pi.energy.gov/enhancingGHGregistry/documents/January2007_1605b TechnicalGuidelines.pdf

7. UK Greenhouse Gas Trading Scheme. 2001. Department for Environment, Food and Rural Affairs (DEFRA) Retrieved 11 August 2008 at http://www.defra.gov.uk/environment/climatechange/trading/uk/pdf/trading-full.pdf.

8. World Resources Institute (WRI), World Business Council for Sustainable Development (WBCSD). The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard. 2004. World Resources Institute: Seattle, WA. p. 116.

9. Guide to PAS 2050: How to assess the carbon footprint of goods and services. 2008. Department for Environment, Food and Rural Affairs (DEFRA).

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8. Glossary

Enterprise

An enterprise includes all beverage-related activities for the BIER reporting company. This will include but not be limited to: all manufacturing operations, offices, research facilities and transportation activities.

Facility/Factory

A facility or factory encompasses a single campus and may include multiple buildings. Examples of facilities include sales offices and research centers, while factories are typically manufacturing plants. This term applies to all on-site activities on the campus (fleet, equipment maintenance, etc.) unless such activities are expressly excluded and reported separately.

Hotel Load

The non-manufacturing and warehouse portion of any plant. Includes the bathrooms and office space of a facility.

Life Cycle

The assessment of the environmental impacts of a given product or service throughout its lifespan, including all phases: raw material production, manufacture, distribution, product use and disposal and all intervening transportation steps.

Product

A standard base sales unit not differentiated by volume (both package and product) (e.g., a bottle of soda, can of beer, PET of juice, or box of wine). A product is a subset of the beverage class; for example, carbonated soft drink, fitness drink, juice, beer, wine, distilled spirits, or water.

SKU

An SKU (stock keeping unit) is a sales unit as defined by reporting organization; for example, a 12-oz can of carbonated soft drink or a 750 ml bottle of wine. For purposes of the aggregation examples provided in Appendix E, *Aggregation and Apportionment of Emissions*; the same SKU can be assigned to products made at different locations.

Value Chain

The network along which products or services move from suppliers to customers, transporting raw materials and transforming them into a finished project, delivering finished product to end users, and disposal or recycling of residual wastes. A value chain may consist of many different suppliers and customers before the product reaches the end user.

Appendix A: Sources of Primary Data

SOURCES OF PRIMARY DATA

The preferred sources for primary data elements are listed in Table A1. (Note that primary data can be used for Scope 1, 2, or 3 emissions as well as for any or all data points in a product footprint.)

Table A1: Data Elements

DATA ELEMENT	SOURCES OF INFORMATION
Electricity used but not generated on site	Meter reading, electrical use invoice, utility usage log
Electricity generated on site	Meter reading
Electricity sold to grid	Meter reading
Natural gas use	Invoice, utility usage log
Coal use	Purchase or delivery records, inventory data, invoice, utility usage log
Purchased steam use	Meter reading, invoice, utility usage log
Fuel oil use	Invoice, utility usage log
Propane use	Invoice, utility usage log
Biogas/landfill gas used as fuel	Invoice, utility usage log
Biomass used as fuel	Purchase or delivery records, inventory data, invoice, utility usage log
Jet fuel (for air fleet)	Invoice
Other energy sources: (specify; e.g., solar, wind, etc.)	Utility usage log

Appendix B: Directory of Data Resources

BIER has developed an interim list of data resources that can be used to complete an enterprise inventory or product carbon footprint. However, the directory is only available to BIER members at this time.

Appendix C: Guidance for Beverage Retail and Home Consumption

INTRODUCTION

There are several aspects of beverage retail that require energy use and result in GHG emissions. For all beverages, the "hotel load," or energy used by the retailer to provide light and control temperature at the retail space must be included in product-level assessments. Also, certain beverage types are often sold at temperatures that differ from the ambient temperature (usually below). The emissions resulting from operation of coolers or vendors to reduce the temperature of these beverages must be included in product assessments.

From a retail standpoint, only cooler/vendor emissions are included in enterprise greenhouse gas (GHG) inventories. Operational boundary considerations for these emissions are discussed in the following sections.

The guidance below is intended for use when primary data for coolers is unavailable. Where available, primary data can be used in lieu of the calculations provided below.

HOTEL LOAD EMISSIONS

Background

Beverages are sold in a variety of retail locations, including grocery stores, convenience stores, or specialty stores. Other times, the beverage company has agreements to place vending machines in schools, offices, theaters or malls. In all of these examples, the beverage is sold in a temperature controlled, lighted area. Beverage companies must account for the area share of floor space (either shelf space or cooler space) dedicated to the sale of their beverage. One notable exception to this requirement are vendors that are located outdoors; for these coolers, hotel load is assumed to be zero since they are not in a temperature controlled space and are subject to natural lighting.

GHG Inventory

Hotel load emissions are not included in the company Scope 1 carbon inventory because these are neither company owned nor controlled activities, nor are they something the company has influence over from a financial standpoint. However, hotel load emissions should be included in the company's Scope 3 inventory.

Product Level Assessment

Product assessments should account for the fraction of the store area sales space dedicated to a functional unit of the subject product, for the average duration that product is on sale at the store. The calculation below recommends an approach to determining the appropriate amount of energy to be assigned to each functional unit.

Hotel Load Emissions (kg CO_2e/ functional unit) = A*B*C*D*E

TERM	UNITS
A = Average daily kWh use of Retailer	**kWh/day**
B = Share of store space dedicated to reporting company sales	**%**
C = Share of company sales area taken by functional unit of product	**%**
D = Residence time of functional unit ***Default = 1 day*** `	**days**
E = Factor electricity grid mixture conversion factors (with inefficiency of the upper supply chain)	**kg CO_2 / kWh**

Note: Default values should be used only if primary data is unavailable.

COOLER/VENDOR EMISSIONS

Background

Operation of vendors and coolers at point-of-sale results in GHG emissions from: 1) electricity required to run the cooler, and 2) refrigerant leaks by the equipment. For all beverages that are sold below ambient temperature at the point-of-sale, emissions associated with chilling must be calculated, regardless of the manufacturer's recommended temperature of consumption.

Calculations for enterprise assessments vary from product-level assessments, as the cooler/ vendor is assumed to be running at all times. The calculation is based on the number of cooler/ vendors in operation. However, for a product-level footprint, calculations are based on the time the beverage remains chilled. Therefore, enterprise and product-level calculations are presented separately below.

COOLER/VENDOR EMISSIONS - ENTERPRISE GREENHOUSE GAS INVENTORY

Fugitive Refrigerant Emissions

Assuming the beverage company assumes financial control of the cooler/vendor, refrigerant leaks from the cooler/vendor unit should appear in the company's Scope 1 inventory. However, the magnitude of these emissions may not meet the company's materiality threshold, and therefore may not need to be included in the company's GHG inventory.

The fugitive refrigerant emissions from cooler/vendor units can be estimated by estimating the percent loss from each unit on an annual basis, as described below.

COOLER VENDOR GHG EMISSIONS - Refrigerant

Refrigerant Emissions	=	Coolers	x	Cooler Refrigerant Content	x	Loss*	x	Global Warming Potential**
(kg CO_2e/yr)		*(Coolers)*		*(kg Refrigerant/Cooler)*		*(%/yr)*		*(kg CO_2e/ kg Refrigerant)*

** In lieu of records indicating the amount of refrigerant required to recharge the system, assume an average loss of 1.5%/yr.*[1]

*** Global Warming Potentials available through Intergovernmental Panel on Climate Change's (IPCC) Fourth Assessment Report (AR4).*

Electricity Consumption

Electricity consumption by coolers and vendors is an indirect emission; however, several circumstances impact whether a company includes these emissions in their Scope 2 or Scope 3 inventory. Often, both the beverage company and the retailer have some financial control and benefit from the cooler/vendor. The nature of these arrangements varies from country to country, or even within a given region.

A beverage company may attribute emissions resulting from the electricity consumption of coolers and vendors in their Scope 2 GHG inventory, if they have financial and operational control of the unit. Beverage companies reporting cooler vendor electricity emissions as Scope 2 must be cautious that the retail location does not double count these emissions by including this electricity consumption in its Scope 2 inventory. Written communication regarding assignment of these emissions is encouraged between the beverage company and retailer.

Alternatively, the beverage company may allocate emissions resulting from electricity consumption of coolers in its Scope 3 inventory. A beverage company should only take this approach if it does not have primary operational control of the unit.

When reporting emissions inventories, beverage companies must clearly state where cooler/vendor emissions have been placed, and why this determination was made. It may also be appropriate to describe what steps the beverage company has made to prevent double counting by its retailers.

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[1] European Commission DG TREN, Preparatory Studies for Eco-design Requirements of EuPs [TREN/D1/40-2005/LOT12/S07.56644]

NOTE: Additional instruction on operational boundaries as they relate to cooler and vendor emissions may be provided in the future, as global protocols (such as The GHG Protocol) are updated.

For GHG inventories, electricity emissions for a particular type of cooler can be estimated using the equation below. Total company emissions from coolers/vendors can be determined by adding the emissions from all types of coolers and vendors in operation across all geographies.

COOLER VENDOR GHG EMISSIONS - Electricity Use (by country)

Electricity Emissions	=	Coolers in Country	x	Avg. Electricity Consumption*	x	Country Electricity Conversion Factor**
(kg CO_2/yr)		*(Coolers)*		*(kWh/Cooler/yr)*		*(kg CO_2/ kWh)*

** Average Electricity Consumption of Coolers will be highly variable highly variable depending on each country's climate, and consumer preferences.*
*** Use of International Energy Agency Data Conversion factors is appropriate here, as they do not include the inefficiency of the electricity transmission losses and other upstream inefficiencies.*

Beverage companies are responsible for determining the average energy consumption of the vendors and coolers in which they send their projects. Coolers and vendors should be tested using either a recognized international standard (e.g. ASHRAE) or established company protocol to determine average energy content.

Cooler/Vendor Emissions - Product Life Cycle Assessment:

Product life cycle assessments are calculated based on the energy required to reduce and maintain the temperature of the beverage and container to the internal temperature of the cooler. The duration of storage and cooler characteristics also factor into the calculation of the product carbon footprint.

For some products, a certain percentage of the product is sold at room temperature, and the remainder sold chilled. In this case, only the volume of product that is sold chilled should be included in this estimate.

If no specific data is available, please find below a minimum GHG allocation for the refrigeration in the supply chain:

$$\text{Cooling Emissions } (g\ CO_2/\text{unit}) = \frac{[A*C*(E-F)+B*C*(E-F)]*[1+H*G]}{I} * J * K * L * M$$

TERM	UNITS
A= Mass of Liquid /Product	**kg**
B = Mass of Primary Packaging	**kg**
C = Specific Heat Capacity Liquid/Product	**kJ/K kg**
D = Specific Heat Capacity Packaging Material	**kJ/K kg**
E = Store/Retail Temperature	**°C or °F**
F = Chill to Temperature (Company recommended sale temperature)	**°C or °F**
G = Number of days stored in the refrigerator: ***Default - 4 days***	**Days**
H = Loads vendors/coolers multiplier ***Door opening only, fixed at 3***	**#**
I = Coefficient of Performance (COP) of chiller cooler/vendors ***Default = 2.5***	**Unitless**
J = Conversion of Kilojoule to Kilowatt-hour = 0.00028	**k Wh/kJ**
K = Electricity grid mixture conversion factors (with inefficiency of the upper supply chain)	**kg CO_2/kWh**
L = Percent product cooled at retail`	**%**
M = Conversion of kilograms to grams = 1000	**g/kg**

Note: Default values should be used only if primary data is unavailable.

Example 500 ml PET bottle of water in GB:

$$\frac{[0.5*4.18*(18-3)+0.018*1*(18-3)]*[1+3*4]}{2.5} * 0.00028 * 0.6 * 0.75 * 1000 = \text{20.72 g } CO_2\text{/ 500 ml bottle}$$

Domestic Refrigeration Emissions

Many beverages are also chilled at the consumer's home before consumption. These beverages are assumed to be at ambient temperature before being placed in the refrigerator. Estimated product storage duration should be based on the size of the container, as well as the expiration date of the product.

Domestic Refrigeration Emissions are excluded from the company Scope 1 carbon inventory for the same reasons as hotel load emissions: the beverage company does not own nor control these activities, nor are they something the company has influence over from a financial perspective. However, domestic refrigeration emissions should be included in the company's Scope 3 inventory.

For product-level assessments, domestic refrigeration emissions can be estimated using the following equation:

$$\text{Cooling Emissions } (g\ CO_2/\text{unit}) = \frac{[A*C*(E-F) + B*C*(E-F)]*[1 + H*G]}{I} * J * K * L * M$$

TERM	UNITS
A = Mass of Liquid /Product	kg
B = Mass of Primary Packaging	kg
C = Specific Heat Capacity Liquid/Product	kJ/K kg
D = Specific Heat Capacity Packaging Material	kJ/K kg
E = Store/Retail Temperature	°C or °F
F = Chill to Temperature (Company recommended sale temperature)	°C or °F
G = Number of days stored in the refrigerator: ***Default Values:*** *200-500 ml: 1 day* *500-1500 ml: 2 days* *1500-or larger: 3 days*	Days
H = Other loads Home multiplier *Door opening only, fixed at 0.3*	#
I = Coefficient of Performance (COP) of chiller cooler/vendors *Default = 1.5*	Unitless
J = Conversion of Kilojoule to Kilowatt-hour = 0.00028	kWh / kJ
K = Electricity grid mixture conversion factors (with inefficiency of the upper supply chain)	kg CO_2 / kWh
L = Percent product cooled at home	%
M = Conversion of kilogram to gram = 1000	g/kg

Note: Default values should be used only if primary data is unavailable.

Example 500 ml PET bottle of water in GB:

$$\frac{[0.5*4.18*(20-5) + 0.018*1*(20-5)]*[1 + 0.3*1]}{1.5} * 0.00028 * 0.6 * 1 * 1000 = 4.6\ g\ CO_2/\ 500\ \text{ml bottle}$$

Appendix D: Transportation Logistics and Product Distribution

INTRODUCTION

Transportation Logistics and product distribution are one of the more challenging parts of the product value chain for carbon accounting. Transportation logistics covers all activities required to deliver raw materials and supplies to the company and between company units. Product distribution covers all the activities to deliver product to the final consumer, from the time the product is moved off the site where primary packaging occurs until it is delivered to the point of consumption.

For most companies, most if not all of these activities are Scope 3, i.e., they are performed by third parties outside the control of the company and hence the company may have limited access to the information needed to accurately calculate carbon emissions.

The majority of the emissions from transportation logistics are likely to come from different forms of transport and this guidance appendix will aim to assist companies in identifying and quantifying these emissions. This guidance document is based on the *WRI/WBCSD Greenhouse Gas (GHG) Protocol - Guide to Calculating CO_2 Emissions from Mobile Sources* (the Mobile Guide 03/21/05 v1.3).

Due to the level of detail in the above document, this guidance does not try to replicate it completely but rather to use it a reference to provide a pragmatic approach for companies to use when assessing the impact of logistics within the beverage industry.

Detail on the specifics of The GHG Protocol guidance are available on The GHG Protocol website.[1]

There is frequent reference throughout this document to *The GHG Protocol - Guide to Calculating CO_2 Emissions from Mobile Sources*, which will be referred to as the "*GHG Protocol Mobile Guide*".

OPERATIONAL BOUNDARIES

Each company will need to define the scope of its corporate GHG inventory and its operational boundaries in accordance with Section 3 of this Sector Guidance document. Any significant emissions from transportation, including raw material procurement and product distribution that are directly attributable to the company (Scope level 1) should be included in the company's carbon inventory. Companies are encouraged where possible to include the entire distribution chain; i.e., delivery up to point of consumption.

DESCRIPTION OF LOGISTICS ACTIVITIES

The process of delivering raw materials and supplies to a manufacturing site and then distributing the finished products to their point of consumption requires energy, and typically GHG emissions. The types of activities requiring power or fuel consumption may include:

- Transport by a vehicle or vessel (e.g., a truck, train, ship, or air carrier.);
- Off-loading or on-loading from or to a vehicle or vessel;
- Temporary storage in a warehouse, distribution center or transfer facility;
- Re-packing of product cases or parcels using automated equipment (e.g., for product display such as from closed to open cases of product);
- Delivery by truck to a retail establishment; and
- Storage of the product at the retail establishment until purchased.

The product may be consumed at the point-of-sale or carried home by the consumer for future consumption. For purposes of this guidance, activities such as the act of consumption, storage of the product at the consumer's home and any preparation are not included.

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[1] The Greenhouse Gas Protocol – All Tools. Retrieved 24 September 2009 at http://www.ghgprotocol.org/calculation-tools/all-tools

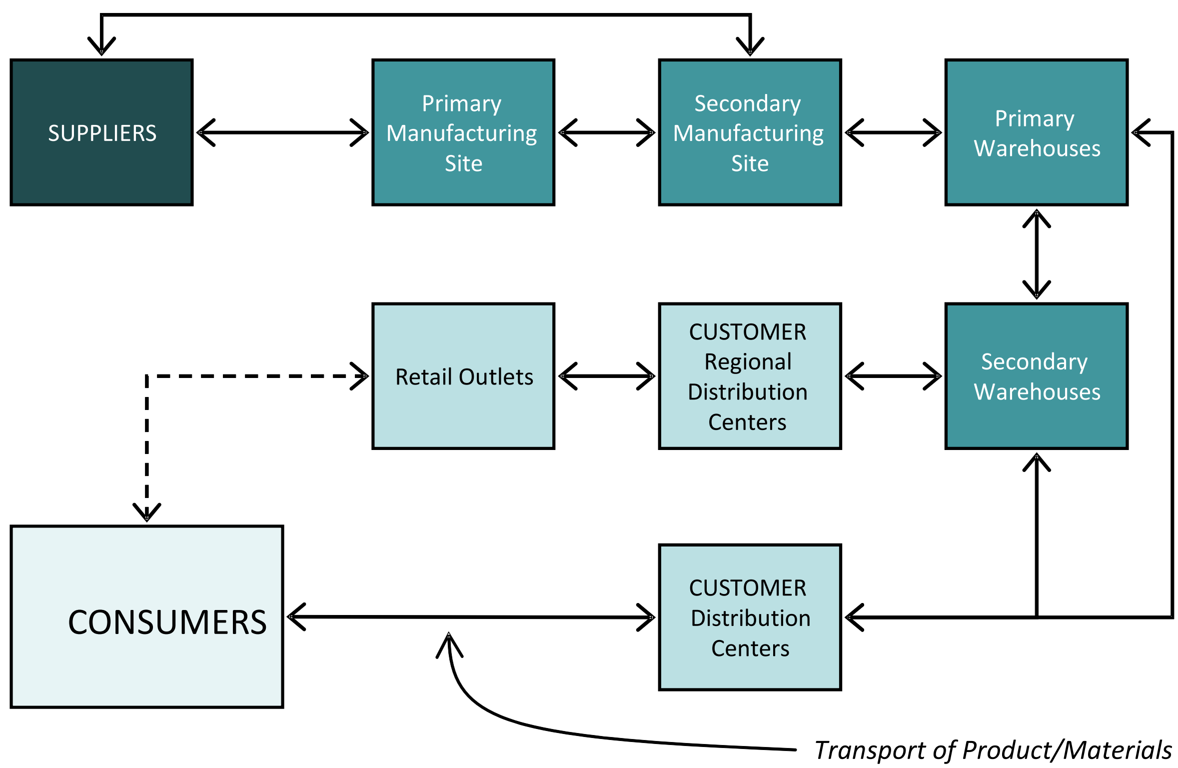


Figure D1. Beverage Industry Value Chain

Suppliers

Activities that occur at the suppliers are likely to be a Scope 3 activity for most companies.

Primary and Secondary manufacturing sites

Activities at the Primary and Secondary manufacturing sites will be a Scope 1 or Scope 3 activity, dependant on the amount of control over them exercised by the company.

Warehousing and distribution centers

Activities at warehousing and distribution centers may be Scope 1 or 3, dependant on the amount of control over them exercised by the company and will include activities such as space heating, lighting, conveying and fork lift truck (FLT) use. Activities associated with logistics such as any off-loading and storage as well as re-packaging should be included in the emissions of the warehouse.

Also consider emissions associated with fuel and/or power consumption by cargo transfer equipment (e.g., cranes, fork lift trucks, conveyors), as well as fuel and/or power consumption for temporary storage of product between off-loading from inbound transport vehicle or vessel and on-loading to outbound transport vehicle or vessel.

Transportation

Transportation between modal points is likely to be Scope 3 for many companies and would include activities such as the use of trucks, trains, ships or air carriers to move the product or raw material.

Transfers

Transfer of product from one transport vehicle or vessel to another; ordinarily this is done when there is a change in transport mode (e.g., from rail to truck), but may be required by government authorities at a control point. Many transfers would occur at a manufacturing site or warehouse and hence would be included in the emissions from that site; however, some transfers take place during the transportation phase (e.g., loading or off-loading sea vessels or air carriers).

Also consider emissions associated with fuel and/or power consumption by cargo transfer equipment (e.g., cranes, fork lift trucks, conveyors), as well as fuel and/or power consumption for temporary storage of product between off-loading from inbound transport vehicle or vessel and on-loading to outbound transport vehicle or vessel.

Repacking

Product cargo handling involving a change in the shipment packaging (e.g., re-packing into a different type of case or parcel, breaking large shipment units down into smaller shipment units). Ordinarily this will be done at a warehouse and should be included in the emissions for that site.

Consider emissions associated with fuel and/or power consumption by automated equipment used for re-packing, and fuel and/or power consumption for the facility during the re-packing activity.

Product Distribution Example

As a simple example, consider a product that is canned or bottled in its primary packaging at the manufacturing site, placed in secondary packaging (e.g., cases), stacked on pallets, and then stabilized with stretch wrap. The pallets are stored temporarily in a holding area, and then loaded onto a freight trailer. The energy for these activities would be covered under the manufacturing site's energy and GHG inventory (Scope 1 and Scope 2). The product distribution portion of the value chain begins when the truck leaves the manufacturing site and begins its journey.

The product may then be shipped over road by a large freight truck to a central distribution center. Product deliveries are managed from this site. The product will be off-loaded from the freight truck and moved to a location in the distribution center for temporary storage. Some of the product may require re-packing to meet the requirements of retail outlets (i.e., the retail customers). The re-packing may be done with automated equipment at the distribution center, or moved to another facility where it is re-packed before being shipped forward. This activity may take place at a regional distribution center closer to the retail outlet. Product is then shipped from the distribution center (or the re-pack facility) onward to market. To reach its destination in the most cost-effective manner, several means of transport may be required (e.g., large freight trucks, rail, ship, air cargo carrier, light delivery trucks). Each point where the product changes shipping mode is a transfer station where product shipping units (e.g., pallets or containers) are moved from the inbound vehicle or vessel (off-loaded) to a storage location, held temporarily until outbound vehicle or vessel for the next freight movement is available, and then transferred onto to that vehicle or vessel (on-loaded).

Product will typically be delivered to a regional distribution center where it will be off-loaded and placed in temporary storage. The distribution center may be owned and operated by the company or by a third party who distributes the product to regional customers for sale to the public. Alternatively, it may be owned by a large retail customer that then distributes the product to one or more of its retail outlets. As previously mentioned, there may be re-packing activities performed at the regional distribution center, for example large shipping pallets or containers may be broken down into smaller shipments units for delivery to smaller retail outlets.

From these distribution centers, it will be on-loaded to delivery trucks (typically smaller and lighter than long-distance freight trucks) that move the product to the retail outlet where the product is sold for consumption by the consumer.

Product distribution can be quite complex and there are many variations of the example given. Some steps may be skipped while in other cases there may be additional steps (e.g., movement from one large regional distribution center to a second tier of local distribution centers).

CHOICE OF GREENHOUSE GASES TO CONSIDER

The degree of difficulty in calculating transportation emissions depends largely on which gases are included in the analysis. Since N_2O and CH_4 emissions comprise a relatively small proportion of overall transportation emissions, only CO_2 emissions should be included (*GHG Protocol Mobile Guide*). Companies that have primary data relating to other GHGs are free to include them and should include a statement to explain the decision made.

SCOPE 3 DATA

As already mentioned, many activities involving a company's value chain are conducted by a third party and hence Scope 3 data is likely to be required. Scope 3 activities are challenging as there are a limited number of service providers that have sophisticated data management systems and are willing to share their data with customers. In most instances, the company will need to rely on secondary data and simplifying assumptions. Appendix B contains default data that can be used if specific data is not available.

When reviewing what data are required, the following key variables should be considered:

- The types of vehicles being employed;
- Transport conditions (e.g., road, track, sea, air conditions);
- Condition of vehicles and vessels;
- How the vehicles and vessels are operated (e.g., speed);
- How fully loaded the vessels and vehicles are during transport; and
- The routes taken to arrive at the destination.

Compiling a Scope 3 carbon emissions inventory will usually be completed in one of three ways:

1. The company compiling the inventory relies on primary data and information from its shipping companies, wholesalers, retailers and other service providers. The company will need to obtain the carbon emissions associated with each step in the product distribution chain as well as the appropriate share of those emissions that should be attributed to the company's products. The company may rely on the service provider to perform this calculation, but should understand how those calculations are done and ensure that the methodology is generally consistent with the company's protocols.

2. The company obtains basic data from the service provider and performs the necessary calculations (see the following section in Appendix D, *Calculation Methodology for Calculation*). In order to do this, the company will need to obtain the apportionment factor (the amount of product carried or stored by the service provider that is owned by the company) and the basis for this factor. Second, the company needs to obtain data sufficient to make a reasonable estimate of carbon emissions.

3. The company obtains basic data from its own records (i.e., the amount of packaging purchased or amount of finished product distributed) and performs the necessary calculations (see the following section in Appendix D, *Calculation Methodology for Transportation*). In order to do this, the company may need to make a number of simplifying assumptions about apportionment factors, distances traveled, etc. (see Appendix D, *BIER Assumptions*). Where sufficient primary data is not available, then default conversion factors may be used in order to make a reasonable estimate of carbon emissions.

Additional factors that need to be taken into account include:

<u>1) Apportionment of the carbon emissions among shared cargo</u>

Many shipments involve vehicles or vessels that haul a range of different products to market. Similarly, distribution centers hold a range of products. The total carbon emitted by any given activity will often need to be allocated to the different products. The allocation method will need to rely on an appropriate unit of measure (e.g., weight, volume) and the company will need to use this measure to estimate an allocation. The measure used and the estimation method and assumptions should be clearly stated. Where primary data is not available, then annual averages may be used and the assumptions made documented.

2) Return trips

This point is in regard to vehicles and vessels that, having delivered the product shipment, then return for the next shipment. The return trip will require energy and carbon emissions and need to be properly accounted. If the vessel or vehicle carries a cargo on the return trip, the company may omit the carbon emissions from its inventory, attributing those emissions to inbound cargo. However, if the vehicle or vessel is known to be empty then it is generally appropriate to include the carbon emissions from this inbound trip as part of the company's product distribution. Where specific details are not known, then the BIER assumptions guide should be followed.

3) De minimus contributions

Finally, the product distribution network will often include small entities or activities that have a *de minimus* contribution to the overall carbon inventory. The entity compiling the carbon inventory will need to decide how to address these small contributors; e.g. whether to create a simplifying assumption to provide a gross estimate to cover all small activities in a given category or simply to omit the activity. See the Sector Guidance, Section 4, *Data Reporting* document for further information about establishing *de minimus* contributions. The entity will need to establish some criteria that constitutes a "*de minimus* activity," the basis for that determination and clearly state how and when this *de minimus* threshold was applied.

CALCULATION METHODOLOGY FOR TRANSPORTATION

For logistics emission sources, either a fuel-based or distance-based methodology to calculate CO_2 emissions can be used. Because the data on fuel is generally more reliable, the fuel-based method is the preferred approach for the companies to use. The distance-based method should be used if sufficiently accurate primary data on fuel is unavailable. As the majority of logistics activities are likely to be Scope 3 for most companies, it is unlikely that accurate fuel data will be available and hence the distance-based method is more likely to be used.

A basic description of the fuel and distance methodologies is given below. For more detail companies should refer to the *GHG Protocol Mobile Guide*.

Fuel-based approach

In the fuel-based approach, fuel consumption is multiplied by the CO_2 emission factor for each fuel type. To use the fuel-based approach, the following forms of data should be available: transportation-specific fuel purchase records, direct measurement of vehicle fuel gauges, or financial records that summarize expenses on fuel.

Step 1: Gather fuel consumption data by fuel type.

Fuel Use = Distance x Fuel Economy Factor

Note: the units for the fuel economy factor will depend on the type of distance traveled activity data known (e.g., gallons per ton-mile if ton-miles given).

Step 2: Convert fuel estimate to CO_2 emissions by multiplying results from step 1 by fuel-specific factors.

CO_2 Emissions = Fuel Used x Emission Factor

Distance-based approach

In the distance-based method, emissions can be calculated by using distance-based emission factors to calculate emissions. To use the distance-based approach, the following data should be available: distance activity data by vehicle type, fuel economy factors by vehicle type, and distance-based emission factors.

Because there are so many discrete steps involved in bringing product from the manufacturing site to the consumer, and typically so many different entities, the company will often need to employ a number of calculation methods, rely on a variety of data sources and make numerous simplifying assumptions.

Calculating emissions requires two main steps:

Step 1: Collect data on distance traveled by vehicle type and fuel type.

Distance traveled data can basically come in three forms: distance (e.g., kilometers) passenger-distance (e.g., passenger-kms), or freight distance (e.g., ton-miles).

Step 2: Convert distance estimate to CO_2 emissions by multiplying results from step 1 by distance-based emission factors.

Appendix B gives default factors for different types of mobile sources and activity data.

CO_2 Emissions = Distance Traveled x Emission Factor

EMISSION FACTORS

Appendix B, Directory of Data Resources shows default CO_2 emission factors, depending on fuel type. In the case of road transportation, companies have the option to override these defaults if they have appropriate data on the type of fuel used (i.e., the type and proportion of fuel additives) based on fuel characteristics for geographical regions. To do so, companies should specify the location where fuel is purchased and use default emission factors for that geographic region. Companies may base customized emission factors on company-specific heat rates and/or carbon content coefficients for each fuel combusted. These data may be available from fuel purchase records.

In most cases, default emission factors will be used, based on generic fuel type categories (e.g., unleaded gasoline, diesel, etc.). However, these emission factors may be customized by using company-specific information on fuel characteristics, based on either: a) company-specific heat rate and/or carbon content coefficient information, or b) the location of gasoline purchases.

BIER ASSUMPTIONS

The following assumptions can be made if more detailed primary data are not available. All assumptions made should be clearly documented by the company.

Use the table below and the map above to reference transportation logistics.

Table D1: Bier Key Assumptions

OPERATION	KEY ASSUMPTIONS	COMMENTS
OVERALL	Scope - Retailer's Supply Chain and consumption excluded from this guidance.	
	BIER secondary data document contains default data for each transport mode.	
	Deliveries where the customer picks up the product part of the way through the logistics supply chain, i.e. from a port (customer pick-ups) are included.	
	Deliveries where the supplier takes responsibility for the delivery of raw materials to a manufacturing site are included.	
	Delivery of agency brands (i.e. brands being distributed for another company as part of a contractual agreement) are excluded and should be included in the carbon footprint of the agency company.	

OPERATION	KEY ASSUMPTIONS	COMMENTS
SEA A to B	Distance traveled = straight line from port to port unless specific data available.	Factor = 1
	Include the other freight modes used and distance traveled to deliver to and collect from vessel.	
	Assume one vessel size used on all routes.	See BIER Secondary data
	Vessel utilization (%).	See BIER Secondary data
	Assume port operations covered within CIF.	
TRUCK B to C	Distance traveled is straight line from load to discharge point. If specific data is not available, then use center of population density for the state or country.	
	Add 25% to nominal distances to account for pre- and post-delivery routing of truck.	Factor = 1.25
	Assume a full truck (13.6m / 40 tonnes gross wt) trailer used.	See BIER Secondary data
	Ignore the age of equipment used or the impact of fuel efficiency.	
	Assume full vehicle equipment utilization.	See BIER Secondary data
TRUCK E to F	Use regional CIF for international journeys. If the journey is within one country, then use specific country data if available. Assume that CIF accounts for local driving conditions.	See BIER Secondary data
RAIL	Source of motive power determines CIF (i.e., electric, diesel). Use regional CIF for all journeys.	Factor = 1 See BIER Secondary data
	Include all other freight modes used and distance traveled to deliver to and collect from railhead for multi-modal journeys.	
	Distance traveled = straight line from load to discharge point.	
AIR	Use a Single CIF for long haul and short haul.	Factor = 1 See BIER Secondary data
WARE-HOUSING	No automated picking / material handling equipment unless specified.	
	No space heating and / or refrigeration unless specified.	See BIER Secondary data
	Use one CIF for warehousing operations unless otherwise advised.	See BIER Secondary data
	CO_2 creation related to repack activities to be counted as 'manufacturing'.	

Table D1: Bier Key Assumptions (continued)

INVENTORY QUALITY ASSURANCE/QUALITY CONTROL

Companies should ensure they follow the guidelines of the BIER GHG Sector Guidance document for data validation.

REPORTING AND DOCUMENTATION

In order to ensure that estimates are independently verifiable, quantitative input data used to develop emission estimates should be clearly documented. For more detail, companies should refer to the *GHG Protocol Mobile Guide*.

CONCLUSION

In calculating transportation related emissions, it is likely that the company will need to make a number of simplifying assumptions so the exercise is manageable while providing a reasonable level of precision. The estimations will rely on:

- Primary data;
- Secondary data;
- Reporting by third parties; e.g., shipping companies, distribution center operators (calculation methodologies; i.e., the *WRI/WBCSD GHG Protocol - Guide to Calculating CO_2 Emissions from Mobile Sources* described in this document); and
- Any simplifying assumptions including the BIER assumptions described in this document.

While flexibility is often needed to complete the exercise, it is important to be transparent in the approach taken. The company should clearly identify how the data (Primary and Secondary) and information were obtained, what assumptions were made, and what calculation techniques were employed. Wherever appropriate, the reasons for relying on the data, making the assumptions and using the calculation methods should be explained.

Appendix E: Aggregation and Apportionment of Emissions

Greenhouse gas (GHG) emissions can be apportioned based on the enterprise, the facility or factory, the product, the SKU or the functional unit such as an 1.5 oz serving size for distilled spirits, or a can of a carbonated soft drink.

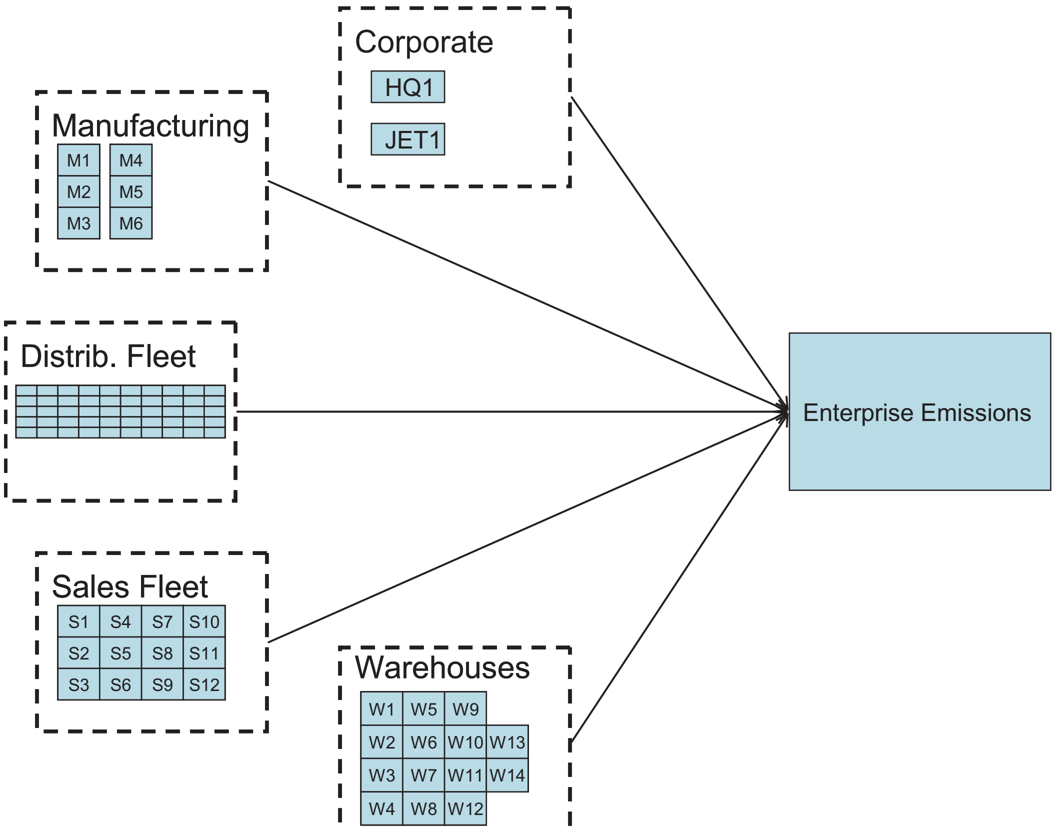
ENTERPRISE AGGREGATION

Calculate the emissions for an enterprise by summing the emissions for all facilities and factories and transportation of products and goods between sites. An example is provided as Example 1 that follows.

Example 1: Aggregation of Emissions from Enterprise Components

A beverage company consists of a corporate headquarters, one corporate jet, six manufacturing plants, a fleet of 50 company-owned trucks, a sales fleet of 12 company-leased vehicles, and 14 warehouses. Because all of these assets are controlled by the beverage company, Scope 1 and 2 emissions can be calculated by taking the sum of respective scope emissions across the enterprise.

$$E_{Enterprise} = E_{HQ} + E_{Jet} + \sum E_{Manufacturing\ Plants} + \sum E_{Distribution} + \sum E_{Sales} + \sum E_{Warehouses}$$

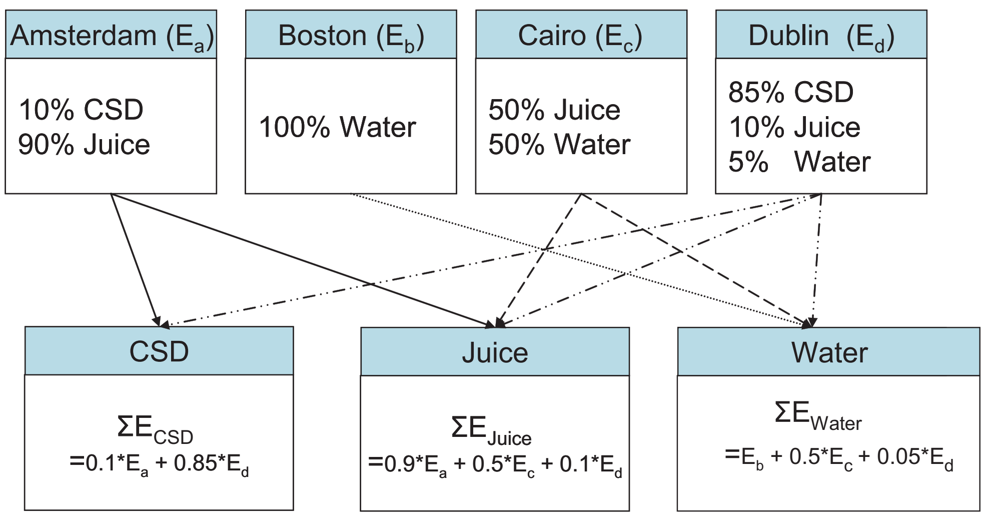


When reporting aggregated emissions, state what entities and Scopes are included in the emissions inventory (i.e., Scope 1 and 2 for beverage manufacturing in South America). When reporting Scope 3 emissions, it is essential that the reporting company state which elements of Scope 3 are included in the inventory. The reporting period must also be stated.

PRODUCT-LEVEL EMISSIONS FROM MANUFACTURING

Calculate the emissions for a product by summing the product-specific emissions over all factories where that product is manufactured. At the factory level, use data from product-specific (i.e., line) meters or records if possible. A fraction of hotel load emissions equal to the volume share of that product made at the facility should be added to the product specific manufacturing emissions. Alternatively, apportion all emissions from the production facility (including hotel load) to the products according to the amount of their relative output (i.e., by volume).

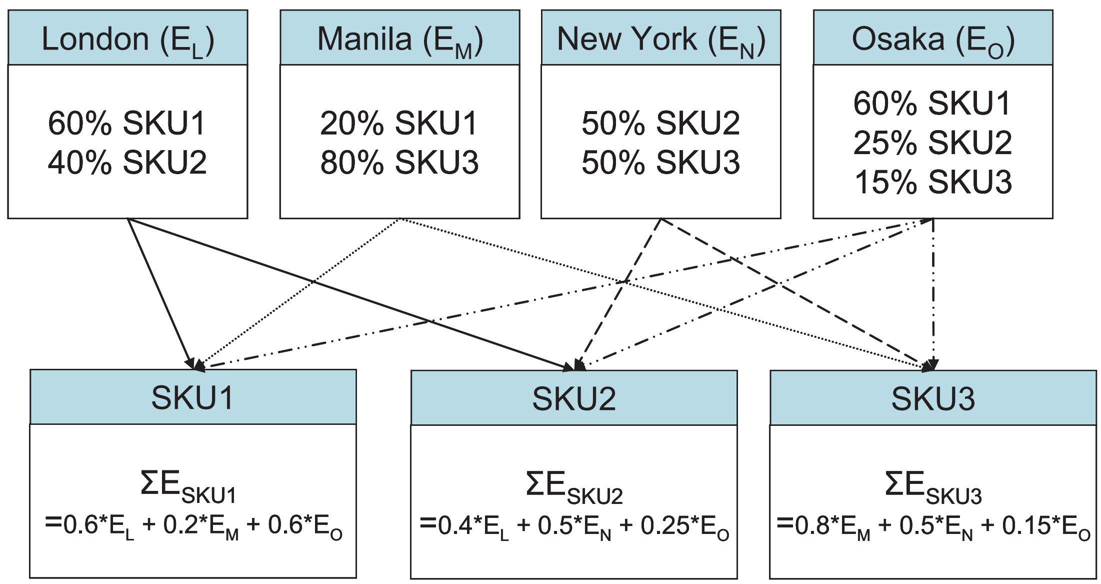
Example 2: Apportioning Emissions to Product Types by Production Volume at Facility



SKU-LEVEL EMISSIONS FROM MANUFACTURING

Calculate the emissions for an SKU by apportioning product-specific emissions by the fraction of a product that is packaged as a particular SKU. Where possible and relevant, calculate emissions on a plant-by-plant basis to account for differences in emission factors across different production locations.

Example 3: Apportioning Emissions to SKUs



Appendix F: Beverage ALcohol Guidance

EMISSION ALLOCATION FOR COMMERCIAL BY-PRODUCTS

The production of certain beverage types may generate by-product(s) that can be sold for commercial purposes (such as an animal feed supplement). In this case, a portion of the relevant greenhouse gas (GHG) emissions should be allocated to the by-product itself.

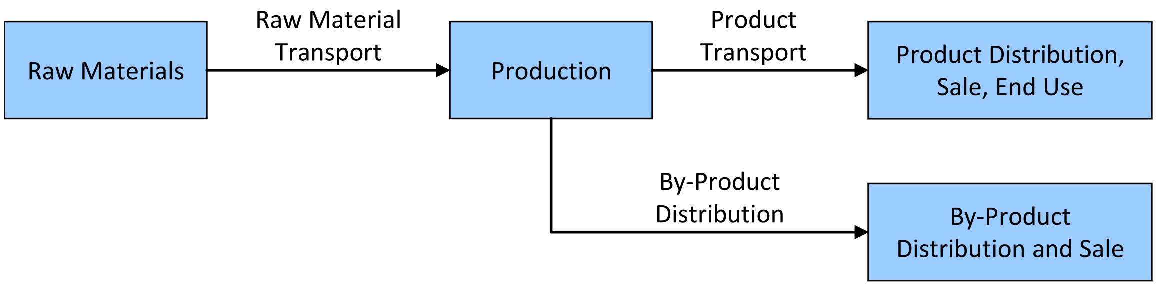


Figure F1. By-Product Allocation

The GHG emissions associated with the by-product include:

- An allocation of the relevant GHG emissions from the raw materials;
- An allocation of the relevant GHG emissions from the transport of the raw materials to the producer;
- An allocation of the GHG emissions from the production operations[1] (Scope 1 and 2); and
- All of the downstream emissions associated with the transportation, storage and sale of the by-product[2].

For GHG emissions associated with the production and transportation of the raw materials, an economic value model should be used for allocating the relevant GHG emissions between the primary product and the by-product.

1. Select the base unit for the raw material (e.g., bushels or tons);
2. Calculate the production yield for both the primary product and by-product (e.g., gallons of product per bushel of raw material);
3. Using the value of the product and by-product, calculate the total revenue per unit of raw material; and
4. Calculate the percentage of revenue contributed by the by-product and use this as the allocation percentage for GHG emissions from raw material production and transportation.

Example 1: Distillers Dried Grains (DDG) from Whiskey Production:

Raw material base unit = bushels of grain

Production Yield:
- Whiskey yield = 5 gallons per bushel
- By-product yield = 15 pounds DDG per bushel

Revenue Calculation:
- One gallon of whiskey = $5.00
- One ton of DDG = $150

Revenue = **(product * product value) + (by-product * by-product value)**
(5 gal/bu * $5/gal) + ([15lb/bu * 1 ton/2,000lb] * $150/ton)
$25/bu + $1.125/bu = $26.125 per bushel of grain

By-Product Allocation = $1.125/$26.125 = 4.3% of raw material GHG emissions allocated to the by-products

While the GHG emissions of the by-product are not allocated to the life cycle GHG emission of the primary product, beverage producers should calculate the by-product life cycle emissions in order to understand which emissions should be allocated to their products.

PRODUCT LIFE CYCLE CALCULATIONS FOR DISTILLED SPIRITS PRODUCT

Unique attributes for distilled spirits products:

- Product may be matured[3] over a number of years;
- Various distilled spirits use different raw materials (e.g., grain, sugarcane, agave);
- Products may be blends from:
  - Multiple producers (e.g., blended Scotch whisky),
  - Multiple product types (e.g., a liquor that uses both a grain neutral spirit and a wine), or
  - Products that have matured for different periods of time (e.g., Kentucky bourbon).

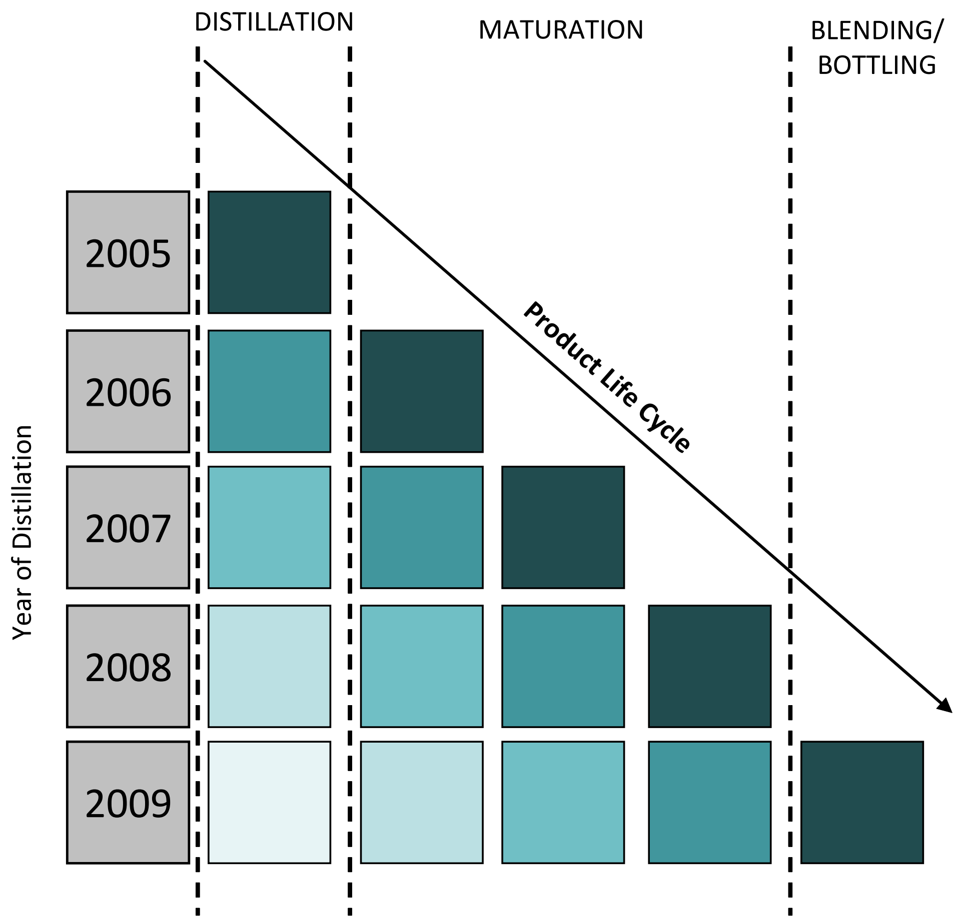


Figure F2. Aged Product Life Cycle

Example 2: Emissions Calculation for Product Manufacture of an Aged Product

Use the current year's Scope 1 and Scope 2 emissions for calculating the contribution of each stage of manufacture. For distilled spirits that have been matured, the loss of product must be known to calculate the "beginning" production volume.

N = Number of years product is aged
A_L = Volume of product lost during one year of aging
W = % of warehouse space occupied by the product to be bottled

Ex. A warehouse contains 100 barrels, and the product to be bottled is contained in 25 barrels; divide product barrels by total barrels to calculate W (25/100 = 25%)

Example:
A whisky produced from a mix of corn, rye and malted barley is matured in a warehouse for four years (N = 4) following distillation, and is then bottled and shipped for distribution.

To determine the GHG emissions per unit of product, the emissions for each stage of manufacture must be calculated while taking into account the material lost during the maturation process.

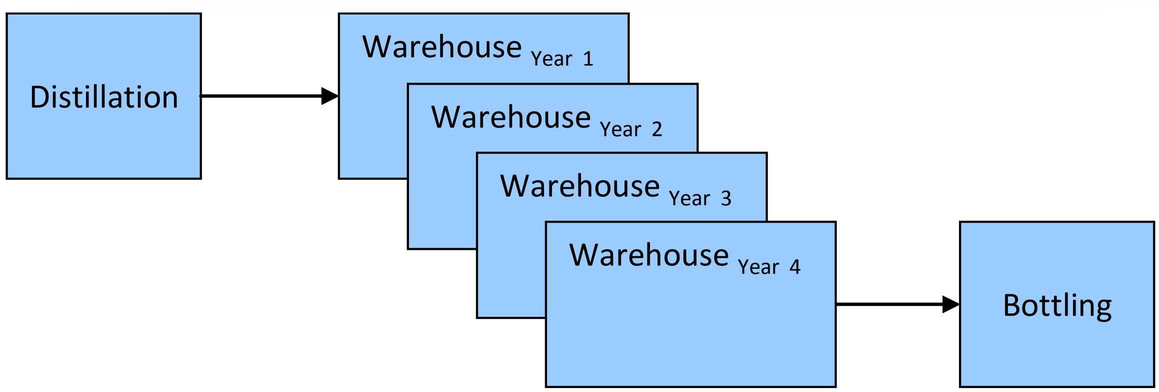


Figure F3. Distilled Product Flow Diagram

The most recent accounting year (e.g., calendar year, fiscal year, rolling consecutive 12-month period) GHG Scope 1 and Scope 2 emissions are as follows:

Distillation: 100 tons CO_{2eq} emitted (100 wine liters of distilled whisky produced)
E_D = 1 ton/L

Aging (Warehouse): 10 tons CO_{2eq} emitted (per year)
E_W = 10 ton/yr
Aging loss (A_L) = 10 wine liters of whisky per year in storage
Warehouse space that each year's inventory occupies (W) = 25%

Bottling: 60 tons CO_{2eq} emitted (60 wine liters of whisky bottled)
E_B = 1 ton/L

The life cycle calculation starts with the finished product produced during the selected accounting year. This will be used to determine how much material was distilled at the beginning of the product's life cycle. For this example, our final volume of product bottled is 60 wine liters, so product distilled four years ago is determined as follows:

$$\text{Amount of Product Distilled } (Vol_D^4) = \text{Bottling} + (A_L)*N$$
$$Vol_D = 60 + (10)*4 = 100 \text{ wine liters}$$

So the GHG emissions associated with the distillation of this year's finished product are:

$$\text{Distillation GHG} = Vol_D * E_D$$
$$\text{Distillation GHG} = 100L * 1 \text{ ton/L} = 100 \text{ tons } CO_{2eq}$$

The next step is to calculate the GHG emissions contribution for the product each year the product was in the warehouse[5]:

Warehouse GHG =
warehouse GHG emissions * % of space in warehouse * number of years in storage

$$\text{Warehouse GHG} = E_W * W * N$$

$$\text{Warehouse GHG} = 10 * 25\% * 4 = 10 \text{ tons } CO_{2eq}$$

The final step is to add the GHG emissions from distillation and warehousing to the emissions from bottling to generate the total GHG emissions within the spirits manufacturer[6].

Spirits GHG = Distillation GHG + Warehouse GHG + Bottling GHG[7]

$$\text{Spirits GHG} = 100 \text{ tons } CO_{2eq} + 10 \text{ tons CO2eq} + 100 \text{ tons } CO_{2eq} = 210 \text{ tons } CO_{2eq}$$

The total GHG emissions are then divided by the final volume of product bottled to calculate the manufacturing portion of the product life cycle:

$$210 \text{ tons } CO_{2eq} / 60 \text{ wine liters product} = 3.5 \text{ tons } CO_{2eq} /L$$

The manufacturing emissions are then added to the emissions from the other segments (raw materials, transportation, distribution, retail/sales/marketing, consumer and end-of-life) to determine the final GHG per unit of product.

Example: Emissions calculation for a blended product - different suppliers:

Blended product composition: 20% Product 1; 15% Product 2; 15% Product 3; 50% Product 4

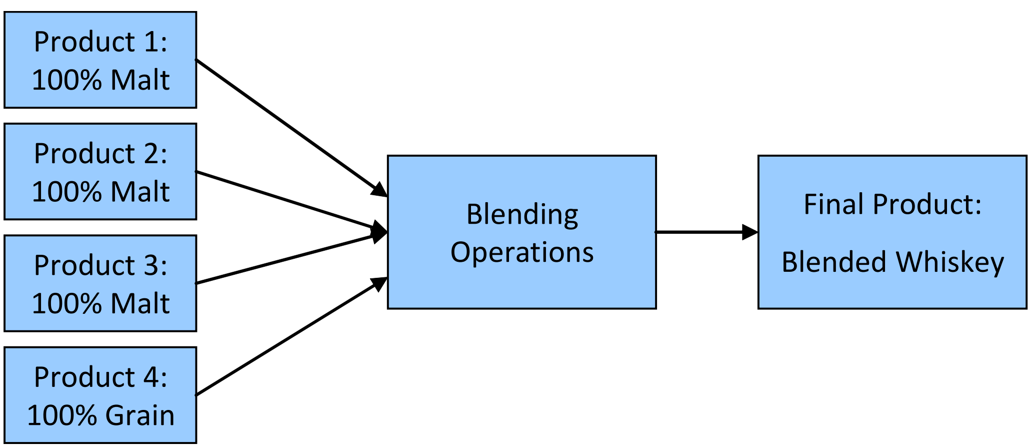


Figure F4. Blended Product Flowchart

GHG for Blended Product = $(0.2)*(E_1) + (0.15)*(E_2) + (0.15)*(E_3) + (0.5)*(E_4) + E_{Blend}$

E_1 is the total relevant GHG emissions for Product 1[8]

E_{Blend} is the Scope 1 and Scope 2 GHG emissions during the blending and bottling process of the final product.

For complex blends (products with more than 10 components), an industry average GHG contribution per unit of product may be used in lieu of producer specific data. This approach is recommended for blend ingredients that make up less than 5% of the total volume of the final product.

EXAMPLE: **Emissions calculation for a blended product - different ages:**

Blended product composition: 20% aged 3 yrs; 20% Aged 4yrs; 60% aged 5 years

GHG for Blended Product = $(0.2)*(E_1) + (0.2)*(E_2) + (0.6)*(E_3)$ + EBlend

E1 is the total relevant GHG emissions during the manufacture of Product 1

- Each different year of product is treated as a separate product in order to properly account for GHG emissions during the maturation process.

E_{Blend} is the Scope 1 and Scope 2 GHG emissions during the blending and bottling process of the final product.

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[1] If known, the actual Scope 1 and 2 emissions for the production of the by-products should be used. If the actual emissions are not known, then the allocation model should be used.

[2] If the end use of the by-product includes its use as feed for animals, any GHG emissions associated with enteric fermentation or manure fermentation emissions should not be applied to the product life cycle.

[3] The term "maturation" is used to describe the storing of distilled spirits for a number of years before the product is then bottled. Some distillers may use the term "aged" in place of "matured"; this case study uses the term "matured" and covers the use of both terms.

[4] The volume distilled should also be used to determine the volume of raw materials required; this information will then be used to calculate the appropriate supply chain GHG emissions as described in this document.

[5] Most producers that handle matured products have a means to calculate their product losses during maturation. Company loss factors may vary; in this example, the loss factor is a simple constant (10 wine liters/year) for that warehouse. Other common methods include: an annual %loss (this assumes a first-order loss curve); or an estimated initial %loss (e.g., from evaporation, spillage, product soaking into the barrel) plus an annual %loss (again, a first order loss curve from, e.g., evaporation, leakage). Producers have flexibility to use the loss factor or loss equation that they believe provides the best estimate for losses. The method used should be consistent with other internal accounting practices and the producer should provide an explanation of how the losses were estimated and any assumptions made.

[6] This equation assumes that all portions of the operation are completed in the same location and no transportation by a mobile source is required (e.g. pipeline transport only). However, transportation emissions must be included if product is transported between production locations by a mobile source.

[7] Bottling emissions must include any operations used to transfer the product from one container to another, any filtration or proof gauging operations (including the production and addition of treated water or other ingredients), sanitation of production equipment, and any bottling, palletizing, and warehousing associated with the final product.

[8] The products supplied by third parties should use the methods described in this guidance to calculate the GHG emissions from production. Information on the relevant GHG emissions for these products may not be available. In this instance, the producer will need to use secondary data or if the suppliers' operations are similar to that of the producer, the site-specific emission factors and aging loss factors can be used to estimate the relevant GHG emissions for these products. The methods used and assumptions should be clearly described by the producer.

Appendix G: Allocation of Environmental Benefits of Collecting and Recycling Materials

INTRODUCTION

Stakeholders involved in the recycling allocation debate are in favor of a system reflecting the real efforts made by reporting companies. BIER considers that a consistent, sustainable approach by the beverage industry relies not only on the measure of the greenhouse gas (GHG) emissions of the products, but also on a broader set of initiatives from which the industry has to show:

- the reduction of packaging and in general the reduction of the environmental footprint at operations level; and
- the contribution to develop collections systems for all types of packaging and to develop new applications for use of recycled material.

The approaches below describe the allocation of benefits associated with recycling materials. In many cases, a certain percentage of materials will be collected for landfill disposal or incineration, rather than for recycling. Companies must account for the emissions associated with final disposal of these materials as part of the product carbon footprint.

DEFINITIONS

The following sections describe the approaches BIER has explored in determining its recommended recycling allocation method.

> *Note: Use of "100:0" or "0:100" is definitively misleading as this wording is used differently with regard to different countries. Instead, this document will describe approaches based on the considerations included in the allocation.*

Composition-Based Allocation

- Container emissions are entirely based on the input material used.
- The GHG emissions of a container are not affected by variation of that material's selective collection rate.
- The GHG emissions of a container are determined by the source of the material; GHG emissions depend on the percent of recycled materials used in the container.
- Maximum emissions assigned to the material when 100% virgin input is used (assuming use of recycled materials is beneficial in a given market).[1]

In the composition-based allocation approach, the environmental impacts of a container are independent from the selective collection rate, so a container sold in a high recycling rate market would have the same impact on the environment as the container sold in a low recycling rate market.

This allocation method encourages beverage companies to use recycled material but does not encourage them to participate actively in programs to increase the selective collection rate of the container in that market.

In case of saturated collecting (more than 70%) and recycling markets, this approach is appropriate. The recycler and material producer is the same, thus the emissions reduction for recycling are allocated to the user of the recycled raw material (such as for steel or glass).

Note: The recycling market for a given material cannot be determined to be saturated or non-saturated based without considering local conditions.

Calculation: $CO_2e = EF_v * \%v + EF_r * \%r$; where:

EFv = Virgin Material Emissions Factor	Includes emissions associated with upstream extraction and production of virgin material.
EFr = Recycled Material Emissions Factor	Emissions associated recycling processes and transportation stream required to produce a useable raw material. This emissions factor should account for emissions associated with material loss during the recycling process.
%v = Percent Composition - Virgin Material	Percent of container composed of virgin material.
%r = Percent Composition - Recycled Material	Percent of container composed of recycled material.

Collection Rate-Based Allocation

- Material emissions entirely based on material selective collection rates (i.e., the percent of used containers which are collected and recycled).
- The GHG emissions of a container are independent of the recycled content used in the container.
- Lower emissions are assigned to the material when 100% virgin input is used, when compared to composition-based allocation.

In the collection rate-based approach, the environmental impacts of a container are independent from the recycled content of the container. This more closely approximates the situation in non-saturated recycled material markets (such as PET, HDPE/PEHD, aluminum, or cardboard in most geographies). The result is that a container using 100% virgin material is assigned the same emissions as a container with high recycled material content.

The collection rate-based approach encourages beverage companies to participate actively in programs to increase the selective collection system efficiency, but does not encourage beverage companies to use recycled material.

Calculation: $CO_2e = EF_v + EF_c * SCR$; where:

EFv = Virgin Material Emissions Factor	Includes emissions associated with upstream extraction and production of virgin material.
EFc = Collection and Recycling Emissions Factor	Affords a reduction in overall emissions associated with use of material by considering the fraction of which will be recycled, and thus burden of introducing virgin raw material is avoided. However, emissions associated with the collection and transportation of recycled materials must be accounted for in this variable. When recycling is beneficial in a given market, this will be a negative value.
SCR = Selective Collection Rate	Average percent of used containers which are collected by the recycling program in a given area (usually defined as a country).

"50:50" Allocation

- Adds half each, of composition- and collection rate-based approaches.
- Relative weighting proposed (50/50) is purely arbitrary.

This approach encourages beverage companies to both use recycled material and to participate actively in programs to increase the selective collection system efficiency. Nevertheless, in the case of non-saturated recycled material markets, this approach increases competition between different applications for recycled material. The environmental impact is not accurately estimated, due to the arbitrary weighting.

Collection Rate-/Composition-Based Allocation - PROPOSED

- Considers application of recycled raw material for same use (i.e., recycled material reused in beverage container).
- Acknowledges efforts made by companies to both use recycled raw material in its packaging, as well as to collect and recycle that package once used.

The collection rate/composition approach considers the beverage container into two pieces - the component from virgin raw material and the component from recycled raw material. The approach incorporates the following considerations:

- For the virgin input section, the calculation is modified to consider the percent of that content which will be recycled following use (collection rate-based allocation approach); and
- For the recycled input component of the bottle, the calculation applies the recycled material emissions factor (composition-based allocation).

Calculation: $CO_2e = [EF_v * \%v + EF_c * SCR * (\%v)] + EF_r * \%r$; where:

EF_v = Virgin Material Emissions Factor	Includes emissions associated with upstream extraction and production of virgin material.
EF_c = Collection and Recycling Emissions Factor	Affords a reduction in overall emissions of a material by considering the fraction of which will be recycled, and thus burden of introducing new virgin material is avoided. However, emissions associated with the collection and transportation of recycled materials must be accounted for in this variable. When recycling is beneficial in a given market, this will be a negative value.
EF_r = Recycled Material Emissions Factor	Emissions associated recycling process and transportation stream required to return materials to useable state. This emissions factor should account for emissions associated with material loss during the recycling process.
SCR = Selective Collection Rate	Average percent of used containers which are collected by the recycling program in a given area (usually defined as a country).
%v = Percent Composition - Virgin Material	Percent of container composed of virgin material.
%r = Percent Composition - Recycled Material	Percent of container composed of recycled material.

BIER Position on Product Carbon Footprint

BIER recognizes that the interest of the beverage industry is to have as soon as possible a common position based on the most defensible arguments.

This would be the basis upon which to generate fair comparison between beverage companies but also to have a common rule that could be recommended for use by all - distributors, regulators, etc.

BIER is recommending the collection rate-based allocation as the default approach, meaning that for:

- Saturated (mature) collection and recycling markets (commonly steel and glass), the environmental benefits are allocated to the recyclers.
- Non-saturated markets (commonly PET, HDPE, aluminum, and cardboard), the environmental benefits are allocated to the beverage producer.

This position is an interim position, pending the review of the market/composition allocation approach by international third-party experts.

Appendix H: Base Year Recalculation Guidance Tool

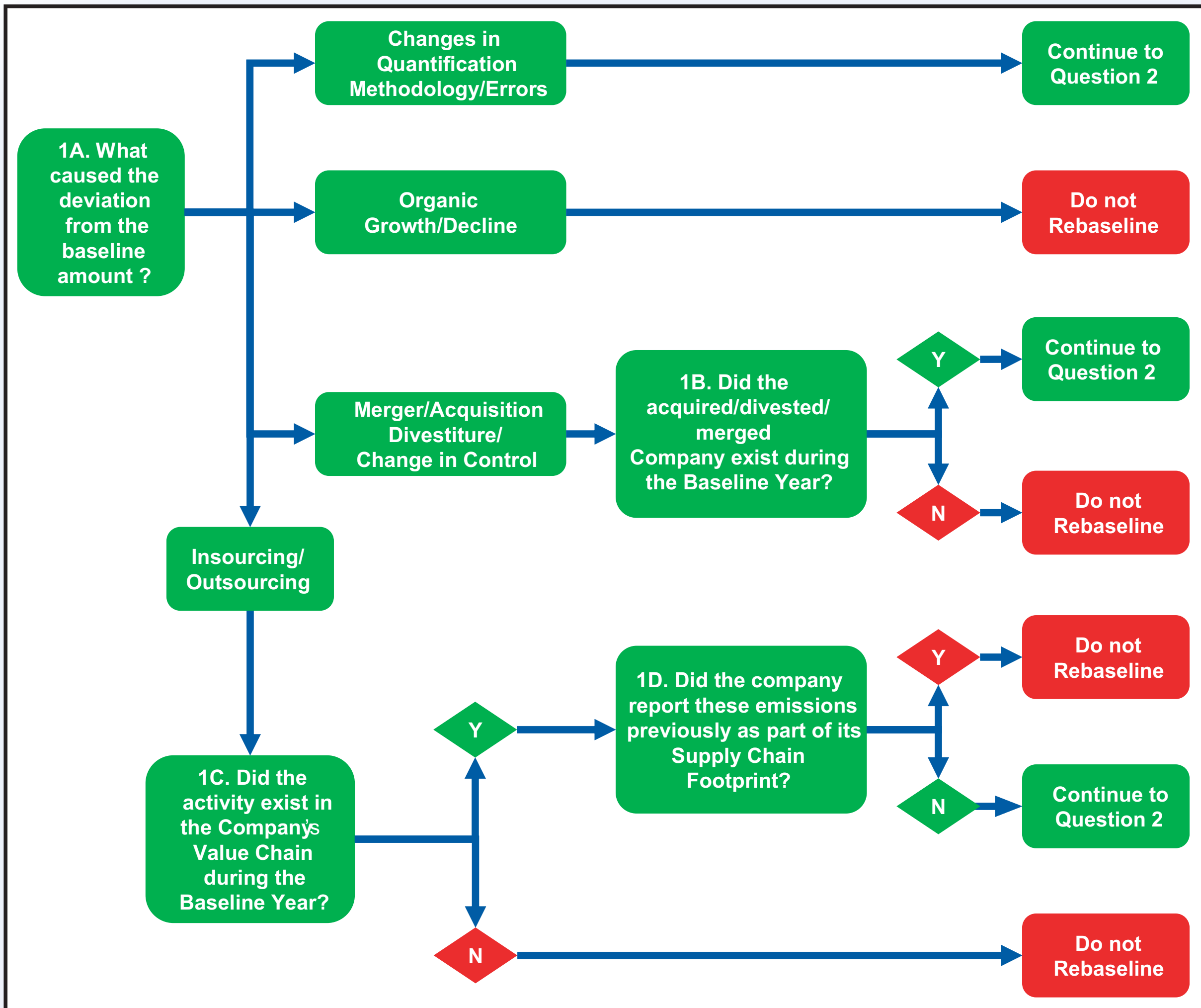
Examples of when companies may consider recalculating their baseline:

- structural changes (acquisition, merger, divestiture)
- insourcing/outsourcing
- change in calculation methodology
- discovery of a mistake
- change in product output

When deciding whether to recalculate the base year greenhouse gas (GHG) emissions, the user walks a fine line between making the data comparable over the years without recalculating the baseline every year. Many circumstances may have caused the metric to shift from the base year emissions. The tool prompts the user to examine the cause of the change through a series of two questions.

Always document the company's decision whether to recalculate or not and why it was made. This will help set precedent for future decisions and allow easy communication with external stakeholders such as sustainability auditors.

Question 1: What caused the deviation from the base year emissions?



Changes in Quantification Methodology

Calculation methodologies may change as more accurate information becomes available. For example, more precise emissions factors may become available as more tests are conducted. In this case, the user would continue to Question 2.

Discovery of Errors

The user would continue to Question 2 if they find significant errors or a number of cumulative errors that are significant.

Organic Growth/Decline

Organic growth/decline refers to an increase or decrease in production output, change in product mix, or openings or closures of operating units controlled by the company. Changes due to organic growth/decline should not trigger a recalculation of base year emissions. Additionally, if the changes reflect real changes in emissions or emission factors, this is organic growth/decline and the user should not recalculate the baseline emissions. Examples of organic growth are the addition of a new product line and building a new building to keep up with demand. Technology changes may also be organic growth or decline. For instance, installing the most energy efficient boiler, which decreases energy use, is an example of a technological change that falls under organic growth/decline. Process changes are also organic growth/decline. For instance, using reverse osmosis recovery to decrease water use decreases the number of steps in the water purification process from 5 to 3, which is an example of organic growth/decline.

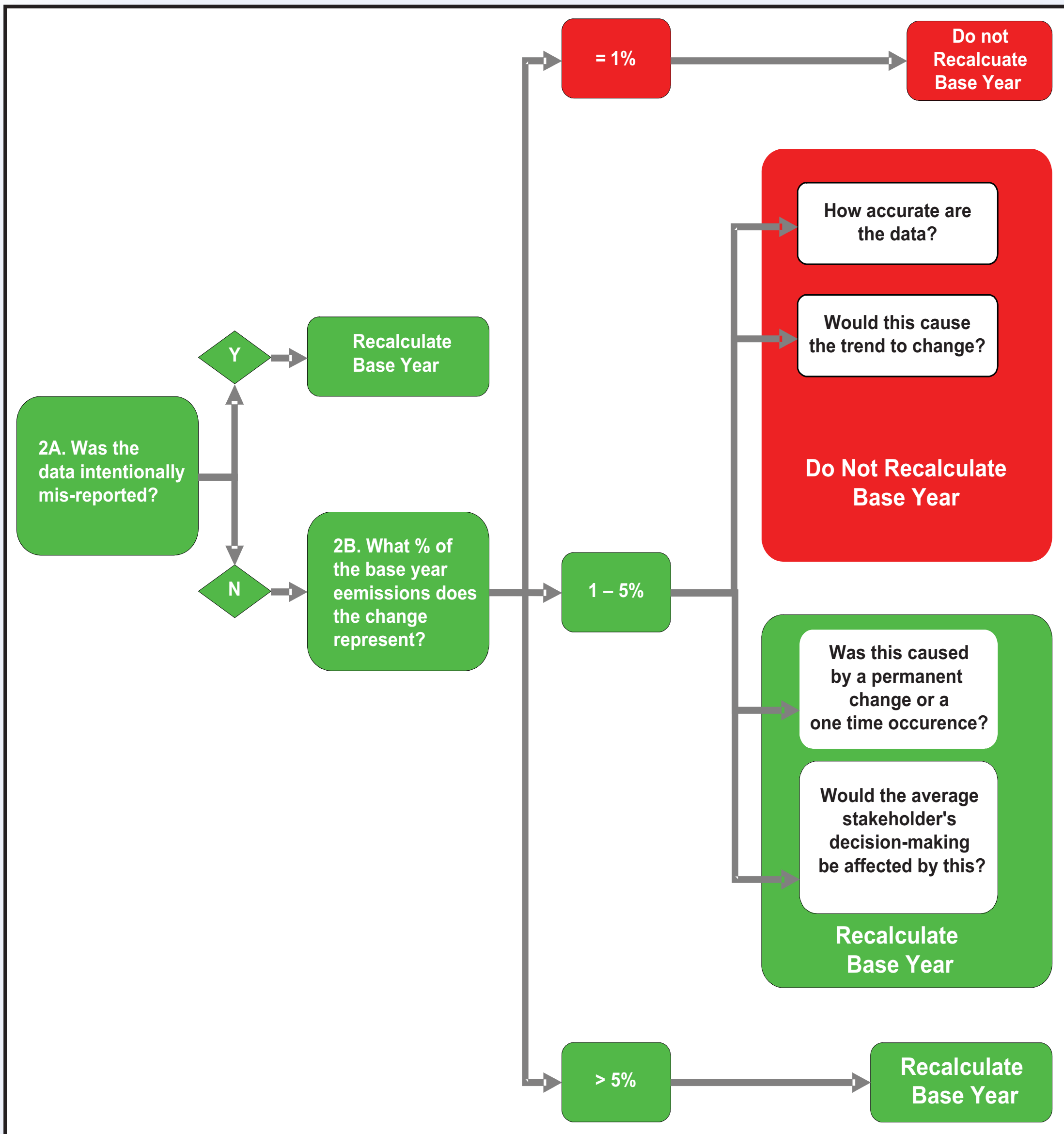
Structural Changes

Structural changes include acquisitions, divestitures, mergers, and changes in control status such as leases. If the entity acquired/divested/merged existed in the baseline year, the user should continue to Question 2. If the entity acquired/divested/merged did not exist in the base year, then it is considered organic growth/decline and the user should not recalculate the company's base year emissions. When a company is using intensity based targets (i.e., Kg CO_2-e/L of product), recalculations for structural changes are not usually needed unless the structural change results in a significant change in the GHG intensity.

Insourcing/Outsourcing

This refers to insourcing/outsourcing of activities in the product's value system. Insourcing is defined as conducting activities in-house that were previously contracted. Outsourcing is contracting activities previously conducted internally. If the activity occurred in the company's value system during the base year, the next question is whether the company reported these impacts. Under some GHG reporting protocols, when carrying out a life cycle assessment, the company may have been reporting emissions from its supply chain. If the company has not reported these impacts, then continue to Question 2. In other cases do not recalculate the baseline.

Question 2. Is the change material/significant?



If the user ended Question 1 in a green box, they should continue to Question 2 to evaluate the significance of the change. A material or significant change is one that would reasonably affect a stakeholder's decision making. To make this determination, a user must examine how the data will be used by the stakeholder.

Were the data intentionally misreported or did they conceal an unlawful transaction?
The answers to each of the last four questions alone should not determine whether a company should recalculate its baseline. Rather, all four of questions taken as a whole should be considered when the decision is made.

- How accurate are the data?
- Would this cause the trend to change?
- Was this caused by a permanent change or a one time occurrence?
- Would the average stakeholder's decision-making be affected by this?

How to Recalculate the Base Year Emissions

If a company decides to recalculate its baseline, it should collect the environmental metric for the year that the baseline was set and then add this number to the baseline. If this historical information is not available, the user can extrapolate the base year emissions from production data by taking the current ratio of emissions to production and multiplying it by production for the baseline year. If this is not a possibility due to data constraints, the user can take the amount of change in the current year and add it to the baseline emissions. When recalculating base year emissions, the user should account for all of the changes that have occurred since the last time base year emissions were recalculated.

When changes occur mid-year, recalculations should be done for the entire year, rather than just the remainder of the year. This avoids recalculating baseline emissions again in the succeeding year. The company can decide if it would like to report the updated environmental metrics for the years in between the base year and the reporting year.

Summary Examples

REASON FOR CHANGE	CHANGE CATEGORY	ACTION
Divestiture of a company that did not exist in the baseline year	Organic decline	Do not recalculate base year emissions
Building of a new plant	Organic growth	Do not recalculate base year emissions
Addition of a line to an existing plant	Organic growth	Do not recalculate base year emissions
Change of production output (i.e., deliver beverage in a powder form instead of a bottle)	Organic growth	Do not recalculate base year emissions
Purchase of own transportation fleet	Insourcing	May recalculate base year emissions
Transport of third-party products (other than company-manufactured) in own transportation fleet	Outsourcing	May recalculate base year emissions
Metered of the plant to obtain more accurate energy use estimates	Error	May recalculate base year emissions
Discovery of falsified data by an employee responsible for reducing energy use in plants	Error	Recalculate base year emissions

Table H1. Summary Examples