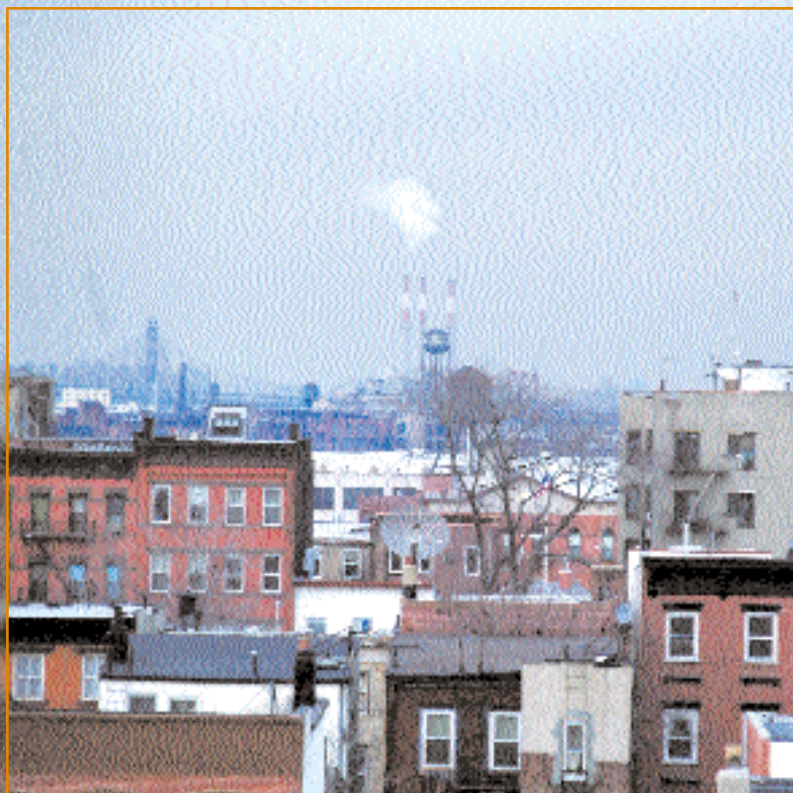


4 Setting Operational Boundaries



After a company has determined its organizational boundaries in terms of the operations that it owns or controls, it then sets its operational boundaries. This involves identifying emissions associated with its operations, categorizing them as direct and indirect emissions, and choosing the scope of accounting and reporting for indirect emissions.

For effective and innovative GHG management, setting operational boundaries that are comprehensive with respect to direct and indirect emissions will help a company better manage the full spectrum of GHG risks and opportunities that exist along its value chain.

Direct GHG emissions are emissions from sources that are owned or controlled by the company.¹

Indirect GHG emissions are emissions that are a consequence of the activities of the company but occur at sources owned or controlled by another company.

What is classified as direct and indirect emissions is dependent on the consolidation approach (equity share or control) selected for setting the organizational boundary (see chapter 3). Figure 2 below shows the relationship between the organizational and operational boundaries of a company.

Introducing the concept of “scope”

To help delineate direct and indirect emission sources, improve transparency, and provide utility for different types of organizations and different types of climate policies and business goals, three “scopes” (scope 1, scope 2, and scope 3) are defined for GHG accounting and reporting purposes. Scopes 1 and 2 are carefully defined in this standard to ensure that two or more companies will not account for emissions in the same scope. This makes the scopes amenable for use in GHG programs where double counting matters.

Companies shall separately account for and report on scopes 1 and 2 at a minimum.

Scope 1: Direct GHG emissions

Direct GHG emissions occur from sources that are owned or controlled by the company, for example, emissions from combustion in owned or controlled boilers, furnaces, vehicles, etc.; emissions from chemical production in owned or controlled process equipment.

Direct CO₂ emissions from the combustion of biomass shall not be included in scope 1 but reported separately (see chapter 9).

GHG emissions not covered by the Kyoto Protocol, e.g. CFCs, NO_x, etc. shall not be included in scope 1 but may be reported separately (see chapter 9).

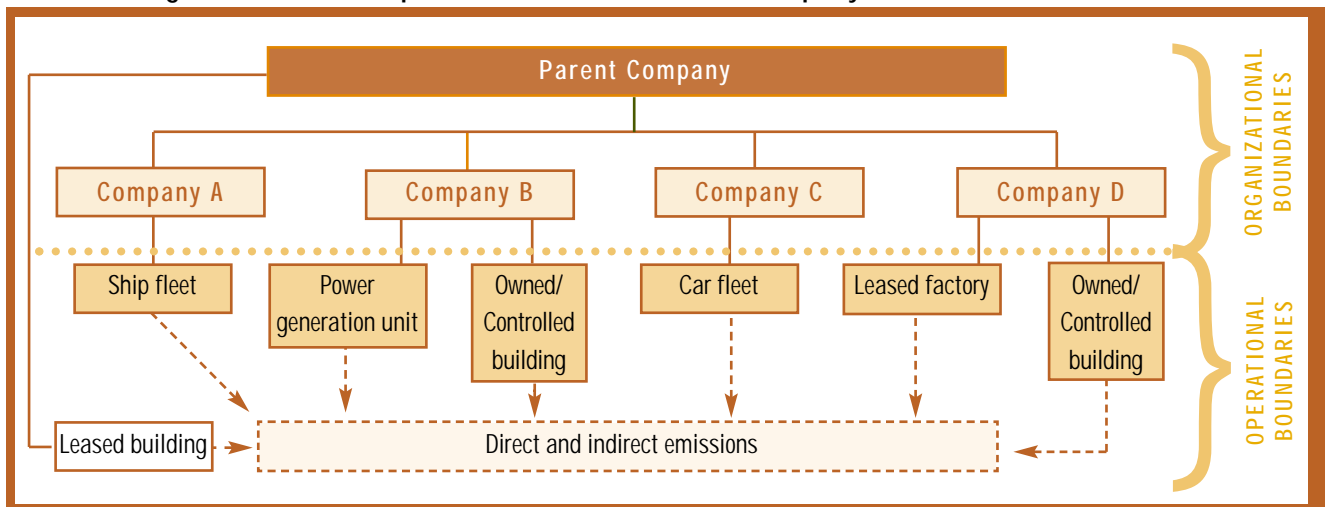
Scope 2: Electricity indirect GHG emissions

Scope 2 accounts for GHG emissions from the generation of purchased electricity² consumed by the company. Purchased electricity is defined as electricity that is purchased or otherwise brought into the organizational boundary of the company. Scope 2 emissions physically occur at the facility where electricity is generated.

Scope 3: Other indirect GHG emissions

Scope 3 is an optional reporting category that allows for the treatment of all other indirect emissions. Scope 3 emissions are a consequence of the activities of the company, but occur from sources not owned or controlled by the company. Some examples of scope 3 activities are extraction and production of purchased materials; transportation of purchased fuels; and use of sold products and services.

FIGURE 2. Organizational and operational boundaries of a company



An operational boundary defines the scope of direct and indirect emissions for operations that fall within a company's established organizational boundary. The operational boundary (scope 1, scope 2, scope 3) is decided at the corporate level after setting the organizational boundary. The selected operational boundary is then uniformly applied to identify and categorize direct and indirect emissions at each operational level (see Box 2). The established organizational and operational boundaries together constitute a company's inventory boundary.

BOX 2. Organizational and operational boundaries

Organization X is a parent company that has full ownership and financial control of operations A and B, but only a 30% non-operated interest and no financial control in operation C.

Setting Organizational Boundary: X would decide whether to account for GHG emissions by equity share or financial control. If the choice is equity share, X would include A and B, as well as 30% of C's emissions. If the approach chosen is financial control, X would count only A and B's emissions as relevant and subject to consolidation. Once this has been decided, the organizational boundary has been defined.

Setting Operational Boundary: Once the organizational boundary is set, X then needs to decide, on the basis of its business goals, whether to account only for scope 1 and scope 2, or whether to include relevant scope 3 categories for its operations.

Operations A, B and C (if the equity approach is selected) account for the GHG emissions in the scopes chosen by X, i.e., they apply the corporate policy in drawing up their operational boundaries.

Accounting and reporting on scopes

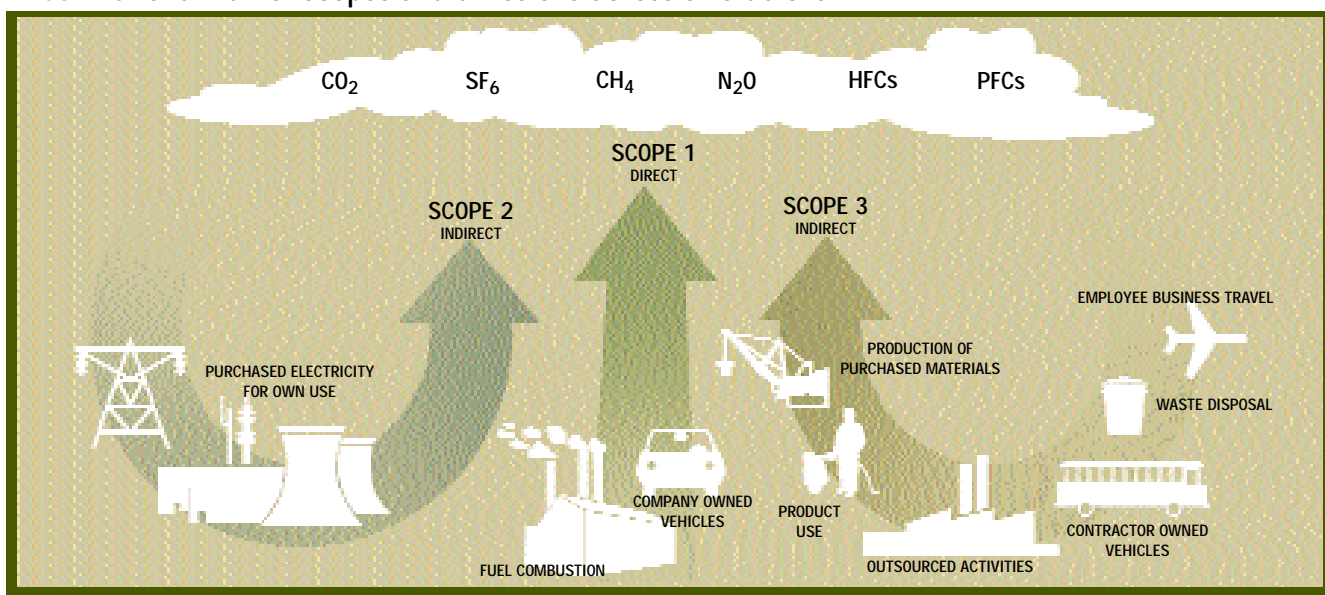
Companies account for and report emissions from scope 1 and 2 separately. Companies may further subdivide emissions data within scopes where this aids transparency or facilitates comparability over time. For example, they may subdivide data by business unit/facility, country, source type (stationary combustion, process, fugitive, etc.), and activity type (production of electricity, consumption of electricity, generation or purchased electricity that is sold to end users, etc.).

In addition to the six Kyoto gases, companies may also provide emissions data for other GHGs (e.g., Montreal Protocol gases) to give context to changes in emission levels of Kyoto Protocol gases. Switching from a CFC to HFC, for example, will increase emissions of Kyoto Protocol gases. Information on emissions of GHGs other than the six Kyoto gases may be reported separately from the scopes in a GHG public report.

Together the three scopes provide a comprehensive accounting framework for managing and reducing direct and indirect emissions. Figure 3 provides an overview of the relationship between the scopes and the activities that generate direct and indirect emissions along a company's value chain.

A company can benefit from efficiency gains throughout the value chain. Even without any policy drivers, accounting for GHG emissions along the value chain may reveal potential for greater efficiency and lower costs (e.g., the use of fly ash as a clinker substitute in the manufacture of cement that reduces downstream emissions from processing of waste fly ash, and upstream

FIGURE 3. Overview of scopes and emissions across a value chain



emissions from producing clinker). Even if such “win-win” options are not available, indirect emissions reductions may still be more cost effective to accomplish than scope 1 reductions. Thus accounting for indirect emissions can help identify where to allocate limited resources in a way that maximizes GHG reduction and return on investment.

Appendix D lists GHG sources and activities along the value chain by scopes for various industry sectors.

Scope 1: Direct GHG emissions

Companies report GHG emissions from sources they own or control as scope 1. Direct GHG emissions are principally the result of the following types of activities undertaken by the company:

- **Generation of electricity, heat, or steam.** These emissions result from combustion of fuels in stationary sources, e.g., boilers, furnaces, turbines
- **Physical or chemical processing.**³ Most of these emissions result from manufacture or processing of chemicals and materials, e.g., cement, aluminum, adipic acid, ammonia manufacture, and waste processing
- **Transportation of materials, products, waste, and employees.** These emissions result from the combustion of fuels in company owned/controlled mobile combustion sources (e.g., trucks, trains, ships, airplanes, buses, and cars)
- **Fugitive emissions.** These emissions result from intentional or unintentional releases, e.g., equipment leaks from joints, seals, packing, and gaskets; methane emissions from coal mines and venting; hydrofluorocarbon (HFC) emissions during the use of refrigeration and air conditioning equipment; and methane leakages from gas transport.

SALE OF OWN-GENERATED ELECTRICITY

Emissions associated with the sale of own-generated electricity to another company are not deducted/netted from scope 1. This treatment of sold electricity is consistent with how other sold GHG intensive products are accounted, e.g., emissions from the production of sold clinker by a cement company or the production of scrap steel by an iron and steel company are not subtracted from their scope 1 emissions. Emissions associated with the sale/transfer of own-generated electricity may be reported in optional information (see chapter 9).

Scope 2: Electricity indirect GHG emissions

Companies report the emissions from the generation of purchased electricity that is consumed in its owned or controlled equipment or operations as scope 2. Scope 2 emissions are a special category of indirect emissions. For many companies, purchased electricity represents one of the largest sources of GHG emissions and the most significant opportunity to reduce these emissions. Accounting for scope 2 emissions allows companies to assess the risks and opportunities associated with changing electricity and GHG emissions costs. Another important reason for companies to track these emissions is that the information may be needed for some GHG programs.

Companies can reduce their use of electricity by investing in energy efficient technologies and energy conservation. Additionally, emerging green power markets⁴ provide opportunities for some companies to switch to less GHG intensive sources of electricity. Companies can also install an efficient on site co-generation plant, particularly if it replaces the purchase of more GHG intensive electricity from the grid or electricity supplier. Reporting of scope 2 emissions allows transparent accounting of GHG emissions and reductions associated with such opportunities.

INDIRECT EMISSIONS

ASSOCIATED WITH TRANSMISSION AND DISTRIBUTION

Electric utility companies often purchase electricity from independent power generators or the grid and resell it to end-consumers through a transmission and distribution (T&D) system.⁵ A portion of the electricity purchased by a utility company is consumed (T&D loss) during its transmission and distribution to end-consumers (see Box 3).

Consistent with the scope 2 definition, emissions from the generation of purchased electricity that is consumed during transmission and distribution are reported in scope 2 by the company that owns or controls the T&D operation. End consumers of the purchased electricity do not report indirect emissions associated with T&D losses in scope 2 because they do not own or control the T&D operation where the electricity is consumed (T&D loss).

BOX 3. Electricity balance

GENERATED ELECTRICITY	=	Purchased electricity consumed by the utility company during T&D
		+ Purchased electricity consumed by end consumers

This approach ensures that there is no double counting within scope 2 since only the T&D utility company will account for indirect emissions associated with T&D losses in scope 2. Another advantage of this approach is that it adds simplicity to the reporting of scope 2 emissions by allowing the use of commonly available emission factors that in most cases do not include T&D losses. End consumers may, however, report their indirect emissions associated with T&D losses in scope 3 under the category “generation of electricity consumed in a T&D system.” Appendix A provides more guidance on accounting for emissions associated with T&D losses.

OTHER ELECTRICITY-RELATED INDIRECT EMISSIONS

Indirect emissions from activities upstream of a company’s electricity provider (e.g., exploration, drilling, flaring, transportation) are reported under scope 3. Emissions from the generation of electricity that has been purchased for resale to end-users are reported in scope 3 under the category “generation of electricity that is purchased and then resold to end users.” Emissions from the generation of purchased electricity for resale to non-end-users (e.g., electricity traders) may be reported separately from scope 3 in “optional information.”

The following two examples illustrate how GHG emissions are accounted for from the generation, sale, and purchase of electricity.

Seattle City Light: Accounting for the purchase of electricity sold to end users

Seattle City Light (SCL), Seattle’s municipal utility company, sells electricity to its end-use customers that is either produced at its own hydropower facilities, purchased through long-term contracts, or purchased on the short-term market. SCL used the first edition of the *GHG Protocol Corporate Standard* to estimate its year 2000 and year 2002 GHG emissions, and emissions associated with generation of net purchased electricity sold to end-users was an important component of that inventory. SCL tracks and reports the amount of electricity sold to end-users on a monthly and annual basis.

SCL calculates net purchases from the market (brokers and other utility companies) by subtracting sales to the market from purchases from the market, measured in MWh. This allows a complete accounting of all emissions impacts from its entire operation, including interactions with the market and end-users. On an annual basis, SCL produces more electricity than there is end-use

Example one (Figure 4): Company A is an independent power generator that owns a power generation plant. The power plant produces 100 MWh of electricity and releases 20 tonnes of emissions per year. Company B is an electricity trader and has a supply contract with company A to purchase all its electricity. Company B resells the purchased electricity (100 MWh) to company C, a utility company that owns / controls the T&D system. Company C consumes 5 MWh of electricity in its T&D system and sells the remaining 95 MWh to company D. Company D is an end user who consumes the purchased electricity (95 MWh) in its own operations. Company A reports its direct emissions from power generation under scope 1. Company B reports emissions from the purchased electricity sold to a non-end-user as optional information separately from scope 3. Company C reports the indirect emissions from the generation of the part of the purchased electricity that is sold to the end-user under scope 3 and the part of the purchased electricity that it consumes in its T&D system under scope 2. End-user D reports the indirect emissions associated with its own consumption of purchased electricity under scope 2 and can optionally report emissions associated with upstream T&D losses in scope 3. Figure 4 shows the accounting of emissions associated with these transactions.

Example two: Company D installs a co-generation unit and sells surplus electricity to a neighboring company E for its consumption. Company D reports all direct emissions from the co-generation unit under scope 1. Indirect emissions from the generation of electricity for export to E are reported by D under optional information separately

demand, but the production does not match load in all months. So SCL accounts for both purchases from the market and sales into the market. SCL also includes the scope 3 upstream emissions from natural gas production and delivery, operation of SCL facilities, vehicle fuel use, and airline travel.

SCL believes that sales to end-users are a critical part of the emissions profile for an electric utility company. Utility companies need to provide information on their emissions profile to educate end-users and adequately represent the impact of their business, the providing of electricity. End-use customers need to rely on their utility company to provide electricity, and except in some instances (green power programs), do not have a choice in where their electricity is purchased. SCL meets a customer need by providing emissions information to customers who are doing their own emissions inventory.

from scope 3. Company E reports indirect emissions associated with the consumption of electricity purchased from the company D's co-generation unit under scope 2.

For more guidance, see Appendix A on accounting for indirect emissions from purchased electricity.

Scope 3: Other indirect GHG emissions

Scope 3 is optional, but it provides an opportunity to be innovative in GHG management. Companies may want to focus on accounting for and reporting those activities that are relevant to their business and goals, and for which they have reliable information. Since companies have discretion over which categories they choose to report, scope 3 may not lend itself well to comparisons across companies. This section provides an indicative list of scope 3 categories and includes case studies on some of the categories.

Some of these activities will be included under scope 1 if the pertinent emission sources are owned or controlled by the company (e.g., if the transportation of products is done in vehicles owned or controlled by the company). To determine if an activity falls within scope 1 or scope 3, the company should refer to the selected consolidation approach (equity or control) used in setting its organizational boundaries.

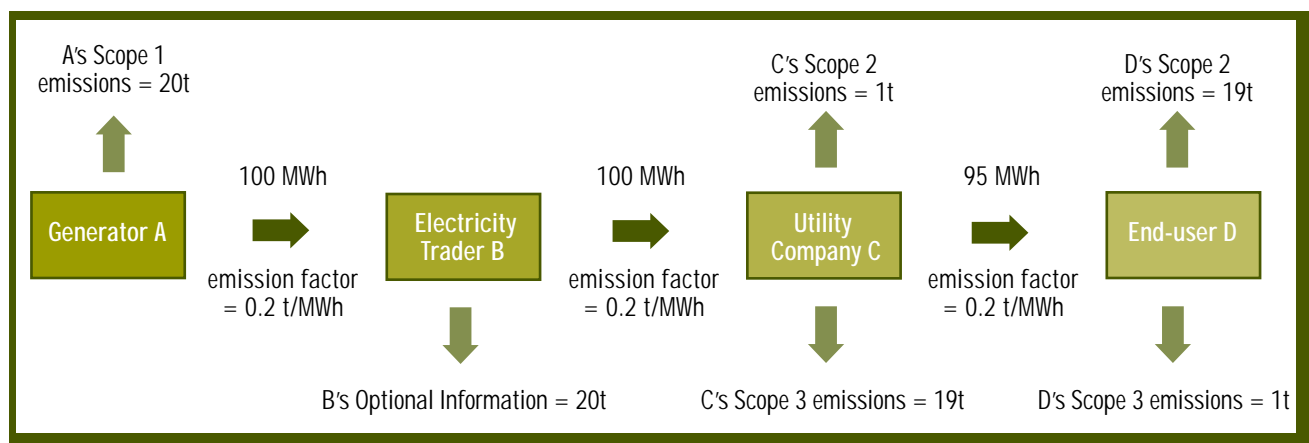
- Extraction and production of purchased materials and fuels⁶
- Transport-related activities
 - Transportation of purchased materials or goods
 - Transportation of purchased fuels
 - Employee business travel
 - Employees commuting to and from work
 - Transportation of sold products
 - Transportation of waste

- Electricity-related activities not included in scope 2 (see Appendix A)
 - Extraction, production, and transportation of fuels consumed in the generation of electricity (either purchased or own generated by the reporting company)
 - Purchase of electricity that is sold to an end user (reported by utility company)
 - Generation of electricity that is consumed in a T&D system (reported by end-user)
- Leased assets, franchises, and outsourced activities—emissions from such contractual arrangements are only classified as scope 3 if the selected consolidation approach (equity or control) does not apply to them. Clarification on the classification of leased assets should be obtained from the company accountant (see section on leases below).
- Use of sold products and services
- Waste disposal
 - Disposal of waste generated in operations
 - Disposal of waste generated in the production of purchased materials and fuels
 - Disposal of sold products at the end of their life

ACCOUNTING FOR SCOPE 3 EMISSIONS

Accounting for scope 3 emissions need not involve a full-blown GHG life cycle analysis of all products and operations. Usually it is valuable to focus on one or two major GHG-generating activities. Although it is difficult to provide generic guidance on which scope 3 emissions to include in an inventory, some general steps can be articulated:

FIGURE 4. GHG accounting from the sale and purchase of electricity



1. Describe the value chain. Because the assessment of scope 3 emissions does not require a full life cycle assessment, it is important, for the sake of transparency, to provide a general description of the value chain and the associated GHG sources. For this step, the scope 3 categories listed can be used as a checklist. Companies usually face choices on how many levels up- and downstream to include in scope 3. Consideration of the company's inventory or business goals and relevance of the various scope 3 categories will guide these choices.

2. Determine which scope 3 categories are relevant. Only some types of upstream or downstream emissions categories might be relevant to the company. They may be relevant for several reasons:

- They are large (or believed to be large) relative to the company's scope 1 and scope 2 emissions
- They contribute to the company's GHG risk exposure
- They are deemed critical by key stakeholders (e.g., feedback from customers, suppliers, investors, or civil society)
- There are potential emissions reductions that could be undertaken or influenced by the company.

The following examples may help decide which scope 3 categories are relevant to the company.

- If fossil fuel or electricity is required to use the company's products, product use phase emissions may be a relevant category to report. This may be especially important if the company can influence product design attributes (e.g., energy efficiency) or customer behavior in ways that reduce GHG emissions during the use of the products.

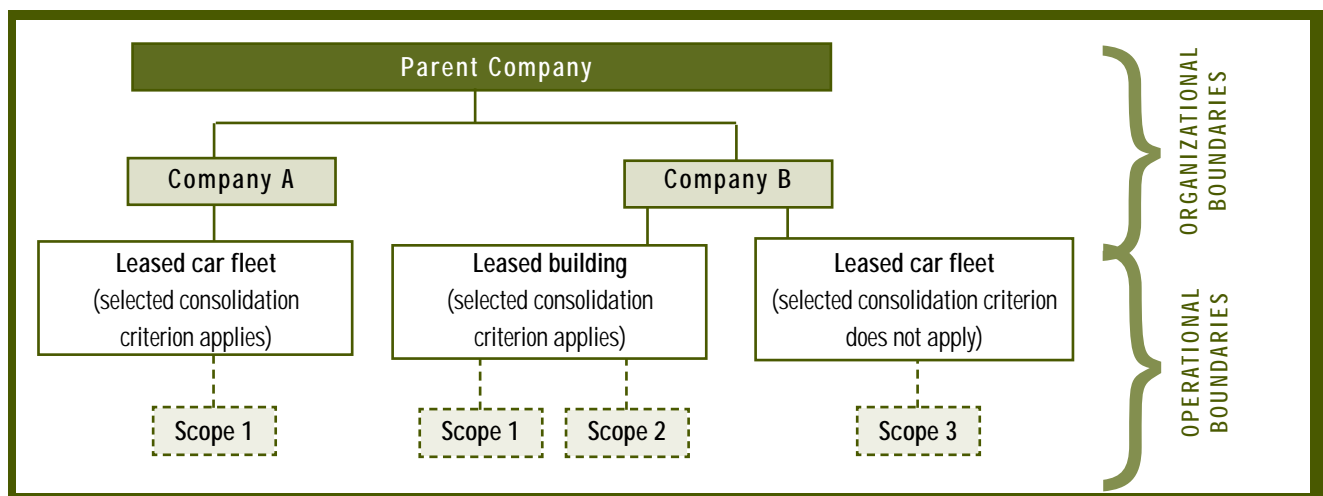
DHL Nordic Express: The business case for accounting for outsourced transportation services

As a major transportation and logistics company in northern Europe, DHL Express Nordic serves large loads and special transport needs as well as world wide express package and document deliveries and offers courier, express, parcel, systemized and specialty business services. Through participation in the Business Leaders Initiative on Climate Change, the company found that 98 percent of its emissions in Sweden originate from the transport of goods via outsourced partner transportation firms. Each partner is required, as an element of the subcontract payment scheme, to enter data on vehicles used, distance traveled, fuel efficiency, and background data. This data is used to calculate total emissions via a tailored calculation tool for outsourced transportation which gives a detailed picture of its scope 3 emissions. Linking data to specific carriers allows the company to screen individual carriers for environmental performance and affect decisions based on each carrier's emissions performance, which is seen through scope 3 as DHL's own performance.

By including scope 3 and promoting GHG reductions throughout the value chain, DHL Express Nordic increased the relevance of its emissions footprint, expanded opportunities for reducing its impacts and improved its ability to recognize cost saving opportunities. Without scope 3, DHL Express Nordic would have lacked much of the information needed to be able to understand and effectively manage its emissions.

SCOPE	EMISSIONS (tCO ₂)
Scope 1	7,265
Scope 2	52
Scope 3	327,634
Total	334,951

FIGURE 5. Accounting of emissions from leased assets



- Outsourced activities are often candidates for scope 3 emissions assessments. It may be particularly important to include these when a previously outsourced activity contributed significantly to a company's scope 1 or scope 2 emissions.
- If GHG-intensive materials represent a significant fraction of the weight or composition of a product used or manufactured (e.g., cement, aluminum), companies may want to examine whether there are opportunities to reduce their consumption of the product or to substitute less GHG-intensive materials.
- Large manufacturing companies may have significant emissions related to transporting purchased materials to centralized production facilities.
- Commodity and consumer product companies may want to account for GHGs from transporting raw materials, products, and waste.
- Service sector companies may want to report on emissions from employee business travel; this emissions source is not as likely to be significant for other kinds of companies (e.g., manufacturing companies).

3. Identify partners along the value chain.

Identify any partners that contribute potentially significant amounts of GHGs along the value chain (e.g., customers/users, product designers/manufacturers, energy providers, etc.). This is important when trying to identify sources, obtain relevant data, and calculate emissions.

4. Quantify scope 3 emissions. While data availability and reliability may influence which scope 3 activities are included in the inventory, it is accepted that data accuracy may be lower. It may be more important to understand the relative magnitude of and possible changes to scope 3 activities. Emission estimates are acceptable as long as there is transparency with regard to the estimation approach, and the data used for the analysis are adequate to support the objectives of the inventory. Verification of scope 3 emissions will often be difficult and may only be considered if data is of reliable quality.

IKEA: Customer transportation to and from its retail stores

IKEA, an international home furniture and furnishings retailer, decided to include scope 3 emissions from customer travel when it became clear, through participation in the Business Leaders Initiative on Climate Change (BLICC) program, that these emissions were large relative to its scope 1 and scope 2 emissions. Furthermore, these emissions are particularly relevant to IKEA's store business model. Customer travel to its stores, often from long distances, is directly affected by IKEA's choice of store location and the warehouse shopping concept.

Customer transportation emission calculations were based on customer surveys at selected stores. Customers were asked for the distance they traveled to the store (based on home postal code), the number of customers in their car, the number of other stores they intended to visit at that shopping center that day, and whether they had access to public transportation to the store. Extrapolating this data to all IKEA stores and multiplying distance by average vehicle efficiencies for each country, the company calculated that 66 percent of its emissions inventory was from scope 3 customer travel. Based on this information, IKEA will have significant influence over future scope 3 emissions by considering GHG emissions when developing public transportation options and home delivery services for its existing and new stores.

Leased assets, outsourcing, and franchises

The selected consolidation approach (equity share or one of the control approaches) is also applied to account for and categorize direct and indirect GHG emissions from contractual arrangements such as leased assets, outsourcing, and franchises. If the selected equity or control approach does not apply, then the company may account for emissions from the leased assets, outsourcing, and franchises under scope 3. Specific guidance on leased assets is provided below:

- **USING EQUITY SHARE OR FINANCIAL CONTROL:** The lessee only accounts for emissions from leased assets that are treated as wholly owned assets in financial accounting and are recorded as such on the balance sheet (i.e., finance or capital leases).

- **USING OPERATIONAL CONTROL:** The lessee only accounts for emissions from leased assets that it operates (i.e., if the operational control criterion applies).

Guidance on which leased assets are operating and which are finance leases should be obtained from the company accountant. In general, in a finance lease, an organization assumes all rewards and risks from the leased asset, and the asset is treated as wholly owned and is recorded as such on the balance sheet. All leased assets that do not meet those criteria are operating leases. Figure 5 illustrates the application of consolidation criteria to account for emissions from leased assets.

Double counting

Concern is often expressed that accounting for indirect emissions will lead to double counting when two different companies include the same emissions in their respective inventories. Whether or not double counting occurs depends on how consistently companies with shared ownership or trading program administrators choose the same approach (equity or control) to set the organizational boundaries. Whether or not double counting matters, depends on how the reported information is used.

Double counting needs to be avoided when compiling national (country) inventories under the Kyoto Protocol, but these are usually compiled via a top-down exercise using national economic data, rather than aggregation of bottom-up company data. Compliance regimes are more likely to focus on the “point of release” of emissions (i.e., direct emissions) and/or indirect emissions from use of electricity. For GHG risk management and voluntary reporting, double counting is less important.

World Resources Institute: Innovations in estimating employee commuting emissions

The World Resources Institute has a long-standing commitment to reduce its annual GHG emissions to net zero through a combination of internal reduction efforts and external offset purchases. WRI's emissions inventory includes scope 2 indirect emissions associated with the consumption of purchased electricity and scope 3 indirect emissions associated with business air travel, employee commuting, and paper use. WRI has no scope 1 direct emissions.

Collecting employee commuting activity data from WRI's 140 staff can be challenging. The method used is to survey employees once each year about their average commuting habits. In the first two years of the initiative, WRI used an Excel spreadsheet accessible to all employees on a shared internal network, but only achieved a 48 percent participation rate. A simplified, web-based survey that downloaded into a spreadsheet improved participation to 65 percent in the third year. Using feedback on the survey design, WRI further simplified and refined survey questions, improved user friendliness, and reduced the time needed to complete the survey to less than a minute. Employee participation rate rose to 88 percent.

Designing a survey that was easily navigable and had clearly articulated questions significantly improved the completeness and accuracy of the employee commuting activity data. An added

benefit was that employees felt a certain amount of pride at having contributed to the inventory development process. The experience also provided a positive internal communications opportunity.

WRI has developed a guide consistent with *GHG Protocol Corporate Standard* to help office-based organizations understand how to track and manage their emissions. *Working 9 to 5 on Climate Change: An Office Guide* is accompanied by a suite of calculation tools, including one for using a survey method to estimate employee commuting emissions. The Guide and tools can be downloaded from the GHG Protocol Initiative website (www.ghgprotocol.org).

Transportation-related emissions are the fastest growing GHG emissions category in the United States. This includes commercial, business, and personal travel as well as commuting. By accounting for commuting emissions, companies may find that several practical opportunities exist for reducing them. For example, when WRI moved to new office space, it selected a building located close to public transportation, reducing the need for employees to drive to work. In its lease, WRI also negotiated access to a locked bike room for those employees who cycle to work. Finally, telework programs significantly reduce commuting emissions by avoiding or decreasing the need to travel.

For participating in GHG markets or obtaining GHG credits, it would be unacceptable for two organizations to claim ownership of the same emissions commodity and it is therefore necessary to make sufficient provisions to ensure that this does not occur between participating companies (see chapter 11).

SCOPES AND DOUBLE COUNTING

The *GHG Protocol Corporate Standard* is designed to prevent double counting of emissions between different companies within scope 1 and 2. For example, the scope 1 emissions of company A (generator of electricity) can be counted as the scope 2 emissions of company B (end-user of electricity) but company A's scope 1 emissions cannot be counted as scope 1 emissions by company C (a partner organization of company A) as long as company A and company C consistently apply the same control or equity share approach when consolidating emissions.

Similarly, the definition of scope 2 does not allow double counting of emissions within scope 2, i.e., two different companies cannot both count scope 2 emissions from the purchase of the same electricity. Avoiding this type of double counting within scope 2 emissions makes it a useful accounting category for GHG trading programs that regulate end users of electricity.

When used in external initiatives such as GHG trading, the robustness of the scope 1 and 2 definitions combined with the consistent application of either the control or equity share approach for defining organizational boundaries allows only one company to exercise ownership of scope 1 or scope 2 emissions.



ABB: Calculating product use phase emissions associated with electrical appliances

ABB, an energy and automation technology company based in Switzerland, produces a variety of appliances and equipment, such as circuit breakers and electrical drives, for industrial applications. ABB has a stated goal to issue Environmental Product Declarations (EPDs) for all its core products based on life cycle assessment. As a part of its commitment, ABB reports both manufacturing and product use phase GHG emissions for a variety of its products using a standardized calculation method and set of assumptions. For example, product use phase calculations for ABB's 4 kW DriveIT Low Voltage AC drive are based on a 15-year expected lifetime and an average of 5,000 annual operating hours. This activity data is multiplied by the average electricity emission factor for OECD countries to produce total lifetime product use emissions.

Compared with manufacturing emissions, product use phase emissions account for about 99 percent of total life cycle emissions for this type of drive. The magnitude of these emissions and ABB's control of the design and performance of this equipment clearly give the company significant leverage on its customers' emissions by improving product efficiency or helping customers design better overall systems in which ABB's products are involved. By clearly defining and quantifying significant value chain emissions, ABB has gained insight into and influence over its emissions footprint.

NOTES

- ¹ The terms "direct" and "indirect" as used in this document should not be confused with their use in national GHG inventories where "direct" refers to the six Kyoto gases and "indirect" refers to the precursors NO_x, NMVOC, and CO.
- ² The term "electricity" is used in this chapter as shorthand for electricity, steam, and heating/cooling.
- ³ For some integrated manufacturing processes, such as ammonia manufacture, it may not be possible to distinguish between GHG emissions from the process and those from the production of electricity, heat, or steam.
- ⁴ Green power includes renewable energy sources and specific clean energy technologies that reduce GHG emissions relative to other sources of energy that supply the electric grid, e.g., solar photovoltaic panels, geothermal energy, landfill gas, and wind turbines.
- ⁵ A T&D system includes T&D lines and other T&D equipment (e.g., transformers).
- ⁶ "Purchased materials and fuels" is defined as material or fuel that is purchased or otherwise brought into the organizational boundary of the company.