



As with financial accounting and reporting, generally accepted GHG accounting principles are intended to underpin and guide GHG accounting and reporting to ensure that the reported information represents a faithful, true, and fair account of a company's GHG emissions.

GHG accounting and reporting practices are evolving and are new to many businesses; however, the principles listed below are derived in part from generally accepted financial accounting and reporting principles. They also reflect the outcome of a collaborative process involving stakeholders from a wide range of technical, environmental, and accounting disciplines.

GHG accounting and reporting shall be based on the following principles:

RELEVANCE

Ensure the GHG inventory appropriately reflects the GHG emissions of the company and serves the decision-making needs of users – both internal and external to the company.

COMPLETENESS

Account for and report on all GHG emission sources and activities within the chosen inventory boundary. Disclose and justify any specific exclusions.

CONSISTENCY

Use consistent methodologies to allow for meaningful comparisons of emissions over time. Transparently document any changes to the data, inventory boundary, methods, or any other relevant factors in the time series.

TRANSPARENCY

Address all relevant issues in a factual and coherent manner, based on a clear audit trail. Disclose any relevant assumptions and make appropriate references to the accounting and calculation methodologies and data sources used.

ACCURACY

Ensure that the quantification of GHG emissions is systematically neither over nor under actual emissions, as far as can be judged, and that uncertainties are reduced as far as practicable. Achieve sufficient accuracy to enable users to make decisions with reasonable assurance as to the integrity of the reported information.



These principles are intended to underpin all aspects of GHG accounting and reporting. Their application will ensure that the GHG inventory constitutes a true and fair representation of the company's GHG emissions. Their primary function is to guide the implementation of the GHG Protocol Corporate Standard, particularly when the application of the standards to specific issues or situations is ambiguous.

Relevance

For an organization's GHG report to be relevant means that it contains the information that users—both internal and external to the company—need for their decision making. An important aspect of relevance is the selection of an appropriate inventory boundary that reflects the substance and economic reality of the company's business relationships, not merely its legal form. The choice of the inventory boundary is dependent on the characteristics of the company, the intended purpose of information, and the needs of the users. When choosing the inventory boundary, a number of factors should be considered, such as:

- Organizational structures: control (operational and financial), ownership, legal agreements, joint ventures, etc.
- Operational boundaries: on-site and off-site activities, processes, services, and impacts
- Business context: nature of activities, geographic locations, industry sector(s), purposes of information, and users of information

More information on defining an appropriate inventory boundary is provided in chapters 2, 3, and 4.

Completeness

All relevant emissions sources within the chosen inventory boundary need to be accounted for so that a comprehensive and meaningful inventory is compiled. In practice, a lack of data or the cost of gathering data may be a limiting factor. Sometimes it is tempting to define a minimum emissions accounting threshold (often referred to as a materiality threshold) stating that a source not exceeding a certain size can be omitted from the inventory. Technically, such a threshold is simply a predefined and accepted negative

bias in estimates (i.e., an underestimate). Although it appears useful in theory, the practical implementation of such a threshold is not compatible with the completeness principle of the GHG Protocol Corporate Standard. In order to utilize a materiality specification, the emissions from a particular source or activity would have to be quantified to ensure they were under the threshold. However, once emissions are quantified, most of the benefit of having a threshold is lost.

A threshold is often used to determine whether an error or omission is a material discrepancy or not. This is not the same as a *de minimis* for defining a complete inventory. Instead companies need to make a good faith effort to provide a complete, accurate, and consistent accounting of their GHG emissions. For cases where emissions have not been estimated, or estimated at an insufficient level of quality, it is important that this is transparently documented and justified. Verifiers can determine the potential impact and relevance of the exclusion, or lack of quality, on the overall inventory report.

More information on completeness is provided in chapters 7 and 10.

Consistency

Users of GHG information will want to track and compare GHG emissions information over time in order to identify trends and to assess the performance of the reporting company. The consistent application of accounting approaches, inventory boundary, and calculation methodologies is essential to producing comparable GHG emissions data over time. The GHG information for all operations within an organization's inventory boundary needs to be compiled in a manner that ensures that the aggregate information is internally consistent and comparable over time. If there are changes in the inventory boundary, methods, data or any other factors affecting emission estimates, they need to be transparently documented and justified.

More information on consistency is provided in chapters 5 and 9.

Volkswagen: Maintaining completeness over time

Volkswagen is a global auto manufacturer and the largest automaker in Europe. While working on its GHG inventory, Volkswagen realized that the structure of its emission sources had undergone considerable changes over the last seven years. Emissions from production processes, which were considered to be irrelevant at a corporate level in 1996, today constitute almost 20 percent of aggregated GHG emissions at the relevant plant sites. Examples of growing emissions sources are new sites for engine testing or the investment into magnesium die-casting equipment at certain production sites. This example shows that emissions sources have to be regularly re-assessed to maintain a complete inventory over time.

Transparency

Transparency relates to the degree to which information on the processes, procedures, assumptions, and limitations of the GHG inventory are disclosed in a clear, factual, neutral, and understandable manner based on clear documentation and archives (i.e., an audit trail). Information needs to be recorded, compiled, and analyzed in a way that enables internal reviewers and external verifiers to attest to its credibility. Specific exclusions or inclusions need to be clearly identified and justified, assumptions disclosed, and appropriate references provided for the methodologies applied and the data sources used. The information should be sufficient to enable a third party to derive the same results if provided with the same source data. A “transparent” report will provide a clear understanding of the issues in the context of the reporting company and a meaningful assessment of performance. An independent external verification is a good way of ensuring transparency and determining that an appropriate audit trail has been established and documentation provided.

More information on transparency is provided in chapters 9 and 10.

Accuracy

Data should be sufficiently precise to enable intended users to make decisions with reasonable assurance that the reported information is credible. GHG measurements, estimates, or calculations should be systemically neither over nor under the actual emissions value, as far as can be judged, and that uncertainties are reduced as far as practicable. The quantification process should be conducted in a manner that minimizes uncertainty. Reporting on measures taken to ensure accuracy in the accounting of emissions can help promote credibility while enhancing transparency.

More information on accuracy is provided in chapter 7.

The Body Shop: Solving the trade-off between accuracy and completeness

As an international, values-driven retailer of skin, hair, body care, and make-up products, the Body Shop operates nearly 2,000 locations, serving 51 countries in 29 languages. Achieving both accuracy and completeness in the GHG inventory process for such a large, disaggregated organization, is a challenge. Unavailable data and costly measurement processes present significant obstacles to improving emission data accuracy. For example, it is difficult to disaggregate energy consumption information for shops located within shopping centers. Estimates for these shops are often inaccurate, but excluding sources due to inaccuracy creates an incomplete inventory.

The Body Shop, with help from the Business Leaders Initiative on Climate Change (BLICC) program, approached this problem with a two-tiered solution. First, stores were encouraged to actively pursue direct consumption data through disaggregated data or direct monitoring. Second, if unable to obtain direct consumption data, stores were given standardized guidelines for estimating emissions based on factors such as square footage, equipment type, and usage hours. This system replaced the prior fragmentary approach, provided greater accuracy, and provided a more complete account of emissions by including facilities that previously were unable to calculate emissions. If such limitations in the measurement processes are made transparent, users of the information will understand the basis of the data and the trade-off that has taken place.

3 Setting Organizational Boundaries



Business operations vary in their legal and organizational structures; they include wholly owned operations, incorporated and non-incorporated joint ventures, subsidiaries, and others. For the purposes of financial accounting, they are treated according to established rules that depend on the structure of the organization and the relationships among the parties involved. In setting organizational boundaries, a company selects an approach for consolidating GHG emissions and then consistently applies the selected approach to define those businesses and operations that constitute the company for the purpose of accounting and reporting GHG emissions.

For corporate reporting, two distinct approaches can be used to consolidate GHG emissions: the equity share and the control approaches. Companies shall account for and report their consolidated GHG data according to either the equity share or control approach as presented below. If the reporting company wholly owns all its operations, its organizational boundary will be the same whichever approach is used.¹ For companies with joint operations, the organizational boundary and the resulting emissions may differ depending on the approach used. In both wholly owned and joint operations, the choice of approach may change how emissions are categorized when operational boundaries are set (see chapter 4).

Equity share approach

Under the equity share approach, a company accounts for GHG emissions from operations according to its share of equity in the operation. The equity share reflects economic interest, which is the extent of rights a company has to the risks and rewards flowing from an operation. Typically, the share of economic risks and rewards in an operation is aligned with the company's percentage ownership of that operation, and equity share will normally be the same as the ownership percentage. Where this is not the case, the economic substance of the relationship the company has with the operation always overrides the legal ownership form to ensure that equity share reflects the percentage of economic interest. The principle of economic substance taking precedent over legal form is consistent with international financial reporting standards. The staff preparing the inventory may therefore need to consult with the company's accounting or legal staff to ensure that the appropriate equity share percentage is applied for each joint operation (see Table 1 for definitions of financial accounting categories).



Control approach

Under the control approach, a company accounts for 100 percent of the GHG emissions from operations over which it has control. It does not account for GHG emissions from operations in which it owns an interest but has no control. Control can be defined in either financial or operational terms. When using the control approach to consolidate GHG emissions, companies shall choose between either the operational control or financial control criteria.

In most cases, whether an operation is controlled by the company or not does not vary based on whether the financial control or operational control criterion is used. A notable exception is the oil and gas industry, which often has complex ownership / operatorship structures. Thus, the choice of control criterion in the oil and gas industry can have substantial consequences for a company's GHG inventory. In making this choice, companies should take into account how GHG emissions accounting and reporting can best be geared to the requirements of emissions reporting and trading schemes, how it can be aligned with financial and environmental reporting, and which criterion best reflects the company's actual power of control.

- **Financial Control.** The company has financial control over the operation if the former has the ability to direct the financial and operating policies of the latter with a view to gaining economic benefits from its activities.² For example, financial control usually exists if the company has the right to the majority of benefits of the operation, however these rights are conveyed. Similarly, a company is considered to financially control an operation if it retains the majority risks and rewards of ownership of the operation's assets.

Under this criterion, the economic substance of the relationship between the company and the operation takes precedence over the legal ownership status, so that the company may have financial control over the operation even if it has less than a 50 percent interest in that operation. In assessing the economic substance of the relationship, the impact of potential voting rights, including both those held by the company and those held by other parties, is also taken into account. This criterion is consistent with international financial accounting standards; therefore, a company has financial control over an operation for GHG accounting purposes if the operation is considered as a group company or subsidiary for the purpose of financial

consolidation, i.e., if the operation is fully consolidated in financial accounts. If this criterion is chosen to determine control, emissions from joint ventures where partners have joint financial control are accounted for based on the equity share approach (see Table 1 for definitions of financial accounting categories).

- **Operational Control.** A company has operational control over an operation if the former or one of its subsidiaries (see Table 1 for definitions of financial accounting categories) has the full authority to introduce and implement its operating policies at the operation. This criterion is consistent with the current accounting and reporting practice of many companies that report on emissions from facilities, which they operate (i.e., for which they hold the operating license). It is expected that except in very rare circumstances, if the company or one of its subsidiaries is the operator of a facility, it will have the full authority to introduce and implement its operating policies and thus has operational control.

Under the operational control approach, a company accounts for 100% of emissions from operations over which it or one of its subsidiaries has operational control.

It should be emphasized that having operational control does not mean that a company necessarily has authority to make all decisions concerning an operation. For example, big capital investments will likely require the approval of all the partners that have joint financial control. Operational control does mean that a company has the authority to introduce and implement its operating policies.

More information on the relevance and application of the operational control criterion is provided in petroleum industry guidelines for reporting GHG emissions (IPIECA, 2003).

Sometimes a company can have joint financial control over an operation, but not operational control. In such cases, the company would need to look at the contractual arrangements to determine whether any one of the partners has the authority to introduce and implement its operating policies at the operation and thus has the responsibility to report emissions under operational control. If the operation itself will introduce and implement its own operating policies, the partners with joint financial control over the operation will not report any emissions under operational control.

Table 2 in the guidance section of this chapter illustrates the selection of a consolidation approach at the corporate level and the identification of which joint operations will be in the organizational boundary depending on the choice of the consolidation approach.

Consolidation at multiple levels

The consolidation of GHG emissions data will only result in consistent data if all levels of the organization follow the same consolidation policy. In the first step, the management of the parent company has to decide on a consolidation approach (i.e., either the equity share or the financial or operational control approach). Once a corporate consolidation policy has been selected, it shall be applied to all levels of the organization.

State-ownership

The rules provided in this chapter shall also be applied to account for GHG emissions from industry joint operations that involve state ownership or a mix of private/state ownership.

BP: Reporting on the basis of equity share

BP reports GHG emissions on an equity share basis, including those operations where BP has an interest, but where BP is not the operator. In determining the extent of the equity share reporting boundary BP seeks to achieve close alignment with financial accounting procedures. BP's equity share boundary includes all operations undertaken by BP and its subsidiaries, joint ventures and associated undertakings as determined by their treatment in the financial accounts. Fixed asset investments, i.e., where BP has limited influence, are not included.

GHG emissions from facilities in which BP has an equity share are estimated according to the requirements of the BP Group Reporting Guidelines for Environmental Performance (BP 2000). In those facilities where BP has an equity share but is not the operator, GHG emissions data may be obtained directly from the operating company using a methodology consistent with the BP Guidelines, or is calculated by BP using activity data provided by the operator.

BP reports its equity share GHG emissions every year. Since 2000, independent external auditors have expressed the opinion that the reported total has been found to be free from material misstatement when audited against the BP Guidelines.

TABLE 1. Financial accounting categories

ACCOUNTING CATEGORY	FINANCIAL ACCOUNTING DEFINITION	ACCOUNTING FOR GHG EMISSIONS ACCORDING TO GHG PROTOCOL CORPORATE STANDARD	
		BASED ON EQUITY SHARE	BASED ON FINANCIAL CONTROL
Group companies / subsidiaries	The parent company has the ability to direct the financial and operating policies of the company with a view to gaining economic benefits from its activities. Normally, this category also includes incorporated and non-incorporated joint ventures and partnerships over which the parent company has financial control. Group companies/subsidiaries are fully consolidated, which implies that 100 percent of the subsidiary's income, expenses, assets, and liabilities are taken into the parent company's profit and loss account and balance sheet, respectively. Where the parent's interest does not equal 100 percent, the consolidated profit and loss account and balance sheet shows a deduction for the profits and net assets belonging to minority owners.	Equity share of GHG emissions	100% of GHG emissions
Associated / affiliated companies	The parent company has significant influence over the operating and financial policies of the company, but does not have financial control. Normally, this category also includes incorporated and non-incorporated joint ventures and partnerships over which the parent company has significant influence, but not financial control. Financial accounting applies the equity share method to associated/affiliated companies, which recognizes the parent company's share of the associate's profits and net assets.	Equity share of GHG emissions	0% of GHG emissions
Non-incorporated joint ventures / partnerships / operations where partners have joint financial control	Joint ventures/partnerships/operations are proportionally consolidated, i.e., each partner accounts for their proportionate interest of the joint venture's income, expenses, assets, and liabilities.	Equity share of GHG emissions	Equity share of GHG emissions
Fixed asset investments	The parent company has neither significant influence nor financial control. This category also includes incorporated and non-incorporated joint ventures and partnerships over which the parent company has neither significant influence nor financial control. Financial accounting applies the cost/dividend method to fixed asset investments. This implies that only dividends received are recognized as income and the investment is carried at cost.	0%	0%
Franchises	Franchises are separate legal entities. In most cases, the franchiser will not have equity rights or control over the franchise. Therefore, franchises should not be included in consolidation of GHG emissions data. However, if the franchiser does have equity rights or operational/financial control, then the same rules for consolidation under the equity or control approaches apply.	Equity share of GHG emissions	100% of GHG emissions

NOTE: Table 1 is based on a comparison of UK, US, Netherlands and International Financial Reporting Standards (KPMG, 2000).

When planning the consolidation of GHG data, it is important to distinguish between GHG accounting and GHG reporting. GHG accounting concerns the recognition and consolidation of GHG emissions from operations in which a parent company holds an interest (either control or equity) and linking the data to specific operations, sites, geographic locations, business processes, and owners. GHG reporting, on the other hand, concerns the presentation of GHG data in formats tailored to the needs of various reporting uses and users.

Most companies have several goals for GHG reporting, e.g., official government reporting requirements, emissions trading programs, or public reporting (see chapter 2). In developing a GHG accounting system, a fundamental consideration is to ensure that the system is capable of meeting a range of reporting requirements. Ensuring that data are collected and recorded at a sufficiently disaggregated level, and capable of being consolidated in various forms, will provide companies with maximum flexibility to meet a range of reporting requirements.

Double counting

When two or more companies hold interests in the same joint operation and use different consolidation approaches (e.g., Company A follows the equity share approach while Company B uses the financial control approach), emissions from that joint operation could be double counted. This may not matter for voluntary corporate public reporting as long as there is adequate disclosure from the company on its consolidation approach. However, double counting of emissions needs to be avoided in trading schemes and certain mandatory government reporting programs.

Reporting goals and level of consolidation

Reporting requirements for GHG data exist at various levels, from a specific local facility level to a more aggregated corporate level. Examples of drivers for various levels of reporting include:

- Official government reporting programs or certain emissions trading programs may require GHG data to be reported at a facility level. In these cases, consolidation of GHG data at a corporate level is not relevant

- Government reporting and trading programs may require that data be consolidated within certain geographic and operational boundaries (e.g., the U.K. Emissions Trading Scheme)
- To demonstrate the company's account to wider stakeholders, companies may engage in voluntary public reporting, consolidating GHG data at a corporate level in order to show the GHG emissions of their entire business activities.

Contracts that cover GHG emissions

To clarify ownership (rights) and responsibility (obligations) issues, companies involved in joint operations may draw up contracts that specify how the ownership of emissions or the responsibility for managing emissions and associated risk is distributed between the parties. Where such arrangements exist, companies may optionally provide a description of the contractual arrangement and include information on allocation of CO₂ related risks and obligations (see Chapter 9).

Using the equity share or control approach

Different inventory reporting goals may require different data sets. Thus companies may need to account for their GHG emissions using both the equity share and the control approaches. The GHG Protocol Corporate Standard makes no recommendation as to whether voluntary public GHG emissions reporting should be based on the equity share or any of the two control approaches, but encourages companies to account for their emissions applying the equity share and a control approach separately. Companies need to decide on the approach best suited to their business activities and GHG accounting and reporting requirements. Examples of how these may drive the choice of approach include the following:

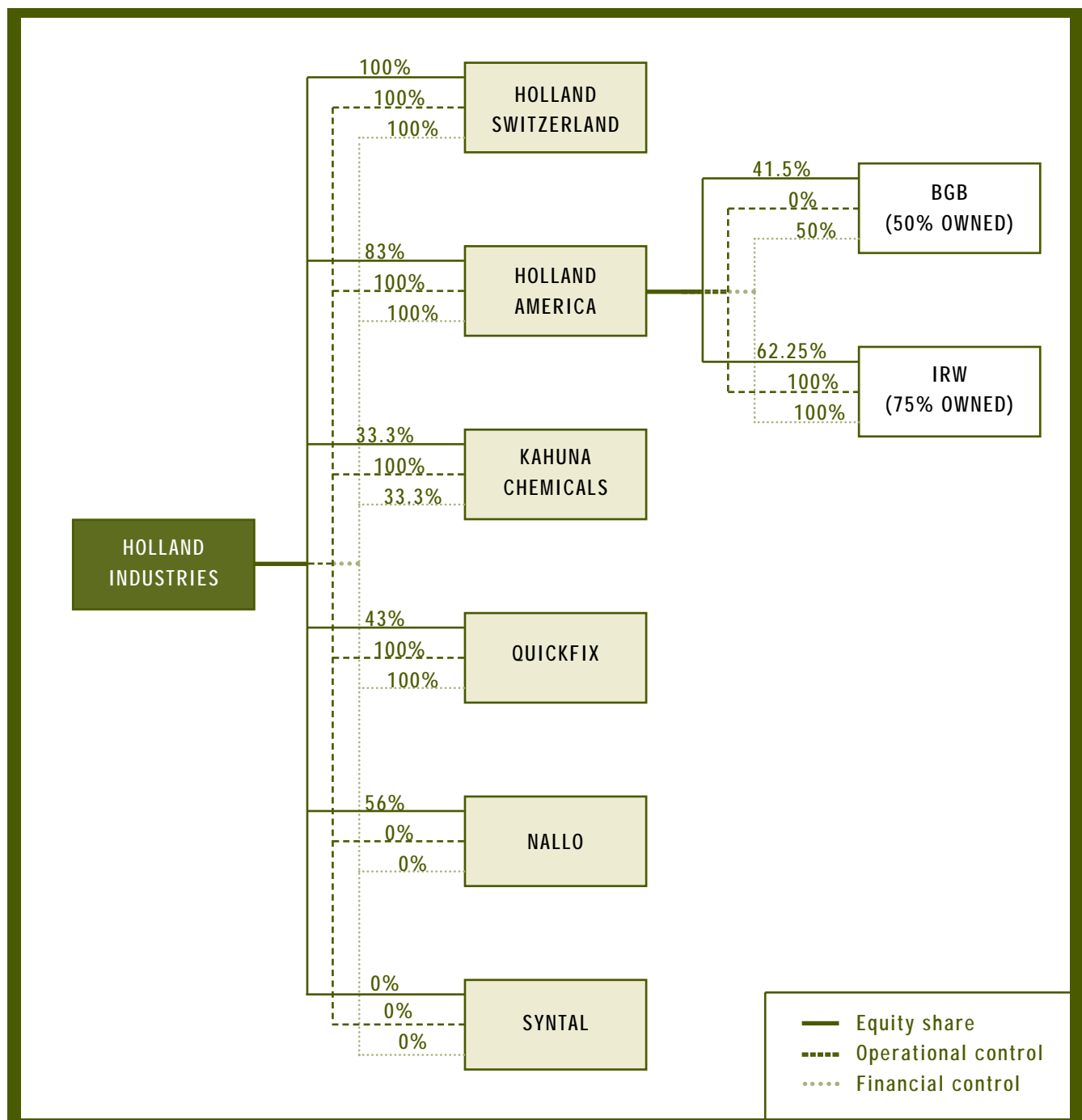
- Reflection of commercial reality. It can be argued that a company that derives an economic profit from a certain activity should take ownership for any GHG emissions generated by the activity. This is achieved by using the equity share approach, since this approach assigns ownership for GHG emissions on the basis of economic interest in a business activity. The control approaches do not always reflect the full GHG emissions portfolio of a company's business activities, but have the advantage that a company takes full ownership of all GHG emissions that it can directly influence and reduce.

- Government reporting and emissions trading programs. Government regulatory programs will always need to monitor and enforce compliance. Since compliance responsibility generally falls to the operator (not equity holders or the group company that has financial control), governments will usually require reporting on the basis of operational control, either through a facility level-based system or involving the consolidation of data within certain geographical boundaries (e.g. the EU ETS will allocate emission permits to the operators of certain installations).
- Liability and risk management. While reporting and compliance with regulations will most likely continue to be based directly on operational control, the ultimate financial liability will often rest with the group company that holds an equity share in the operation or has financial control over it. Hence, for assessing risk, GHG reporting on the basis of the equity share and financial control approaches provides a more complete picture. The equity share approach is likely to result in the most comprehensive coverage of liability and risks. In the future, companies might incur liabilities for GHG emissions produced by joint operations in which they have an interest, but over which they do not have financial control. For example, a company that is an equity shareholder in an operation but has no financial control over it might face demands by the companies with a controlling share to cover its requisite share of GHG compliance costs.
- Alignment with financial accounting. Future financial accounting standards may treat GHG emissions as liabilities and emissions allowances/credits as assets. To assess the assets and liabilities a company creates by its joint operations, the same consolidation rules that are used in financial accounting should be applied in GHG accounting. The equity share and financial control approaches result in closer alignment between GHG accounting and financial accounting.
- Management information and performance tracking. For the purpose of performance tracking, the control approaches seem to be more appropriate since managers can only be held accountable for activities under their control.
- Cost of administration and data access. The equity share approach can result in higher administrative costs than the control approach, since it can be difficult and time consuming to collect GHG emissions data from joint operations not under the control of the reporting company. Companies are likely to have better access to operational data and therefore greater ability to ensure that it meets minimum quality standards when reporting on the basis of control.
- Completeness of reporting. Companies might find it difficult to demonstrate completeness of reporting when the operational control criterion is adopted, since there are unlikely to be any matching records or lists of financial assets to verify the operations that are included in the organizational boundary.

Royal Dutch/Shell: Reporting on the basis of operational control

In the oil and gas industry, ownership and control structures are often complex. A group may own less than 50 percent of a venture's equity capital but have operational control over the venture. On the other hand, in some situations, a group may hold a majority interest in a venture without being able to exert operational control, for example, when a minority partner has a veto vote at the board level. Because of these complex ownership and control structures, Royal Dutch/Shell, a global group of energy and petrochemical companies, has chosen to report its GHG emissions on the basis of operational control. By reporting 100 percent of GHG emissions from all ventures under its operational control, irrespective of its share in the ventures' equity capital, Royal Dutch/Shell can ensure that GHG emissions reporting is in line with its operational policy including its Health, Safety and Environmental Performance Monitoring and Reporting Guidelines. Using the operational control approach, the group generates data that is consistent, reliable, and meets its quality standards.

FIGURE 1. Defining the organizational boundary of Holland Industries



AN ILLUSTRATION:

THE EQUITY SHARE AND CONTROL APPROACHES

Holland Industries is a chemicals group comprising a number of companies/joint ventures active in the production and marketing of chemicals. Table 2 outlines the organizational structure of Holland Industries and shows how GHG emissions from the various wholly owned and joint operations are accounted for under both the equity share and control approaches.

In setting its organizational boundary, Holland Industries first decides whether to use the equity or control approach for consolidating GHG data at the

corporate level. It then determines which operations at the corporate level meet its selected consolidation approach. Based on the selected consolidation approach, the consolidation process is repeated for each lower operational level. In this process, GHG emissions are first apportioned at the lower operational level (subsidiaries, associate, joint ventures, etc.) before they are consolidated at the corporate level. Figure 1 presents the organizational boundary of Holland Industries based on the equity share and control approaches.

TABLE 2. Holland Industries - organizational structure and GHG emissions accounting

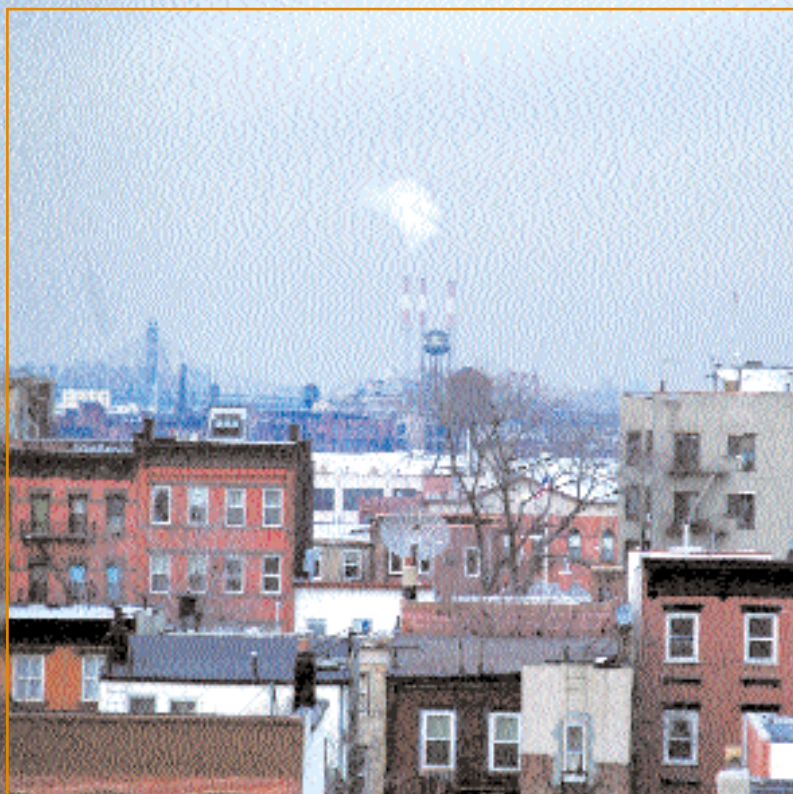
WHOLLY OWNED AND JOINT OPERATIONS OF HOLLAND	LEGAL STRUCTURE AND PARTNERS	ECONOMIC INTEREST HELD BY HOLLAND INDUSTRIES	CONTROL OF OPERATING POLICIES	TREATMENT IN HOLLAND INDUSTRIES' FINANCIAL ACCOUNTS (SEE TABLE 1)	EMISSIONS ACCOUNTED FOR AND REPORTED BY HOLLAND INDUSTRIES	
					EQUITY SHARE APPROACH	CONTROL APPROACH
Holland Switzerland	Incorporated company	100%	Holland Industries	Wholly owned subsidiary	100%	100% for operational control 100% for financial control
Holland America	Incorporated company	83%	Holland Industries	Subsidiary	83%	100% for operational control 100% for financial control
BGB	Joint venture, partners have joint financial control other partner Rearden	50% by Holland America	Rearden	via Holland America	41.5% (83% x 50%)	0% for operational control 50% for financial control (50% x 100%)
IRW	Subsidiary of Holland America	75% by Holland America	Holland America	via Holland America	62.25% (83% x 75%)	100% for operational control 100% for financial control
Kahuna Chemicals	Non-incorporated joint venture; partners have joint financial control; two other partners: ICT and BCSF	33.3%	Holland Industries	Proportionally consolidated joint venture	33.3%	100% for operational control 33.3% for financial control
QuickFix	Incorporated joint venture, other partner Majox	43%	Holland Industries	Subsidiary (Holland Industries has financial control since it treats Quick Fix as a subsidiary in its financial accounts)	43%	100% for operational control 100% for financial control
Nallo	Incorporated joint venture, other partner Nagua Co.	56%	Nallo	Associated company (Holland Industries does not have financial control since it treats Nallo as an Associated company in its financial accounts)	56%	0% for operational control 0% for financial control
Syntal	Incorporated company, subsidiary of Erewhon Co.	1%	Erewhon Co.	Fixed asset investment	0%	0% for operational control 0% for financial control

In this example, Holland America (not Holland Industries) holds a 50 percent interest in BGB and a 75 percent interest in IRW. If the activities of Holland Industries itself produce GHG emissions (e.g., emissions associated with electricity use at the head office), then these emissions should also be included in the consolidation at 100 percent.

NOTES

- ¹ The term "operations" is used here as a generic term to denote any kind of business activity, irrespective of its organizational, governance, or legal structures.
- ² Financial accounting standards use the generic term "control" for what is denoted as "financial control" in this chapter.

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).

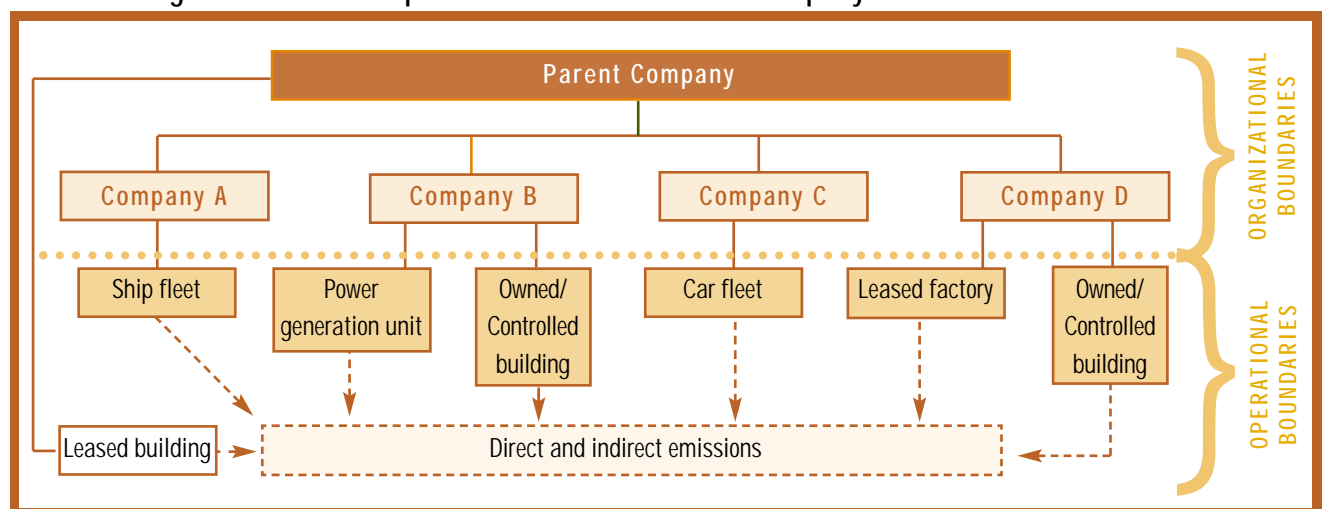
Scope 2: Electricity indirect GHG emissions

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

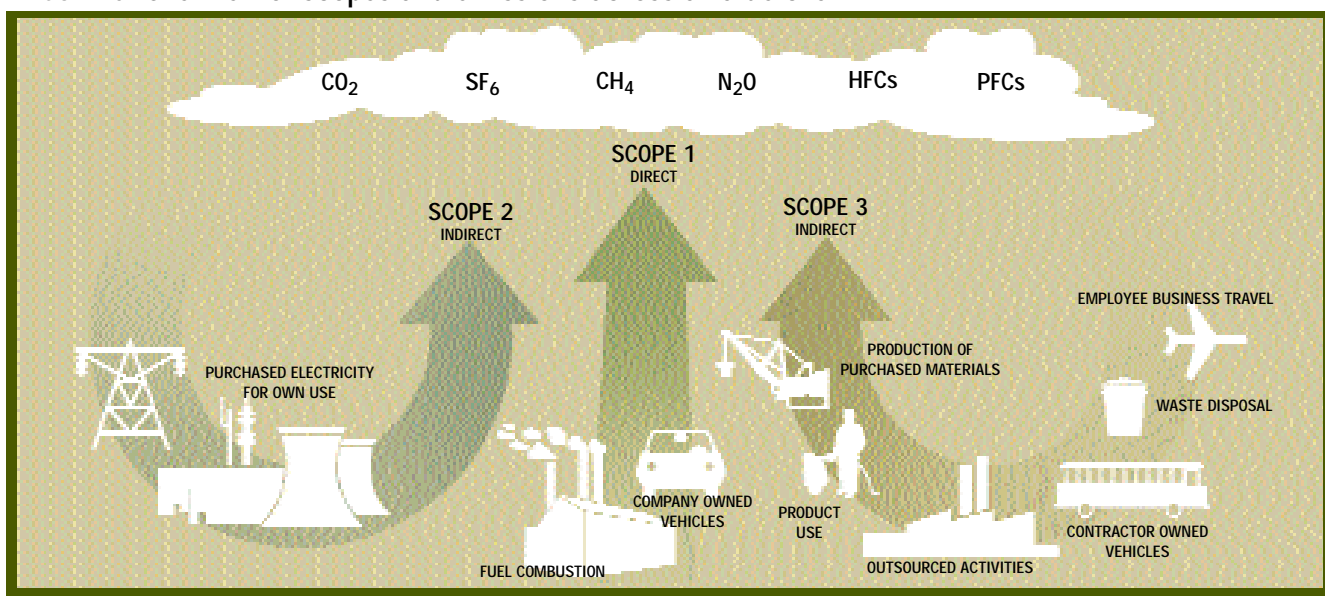
Companies account for and report emissions from scope 1 and 2 separately. Companies may further subdivide emissions data within scopes where this aids transparency or facilitates comparability over time. For example, they may subdivide data by business unit/facility, country, source type (stationary 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.

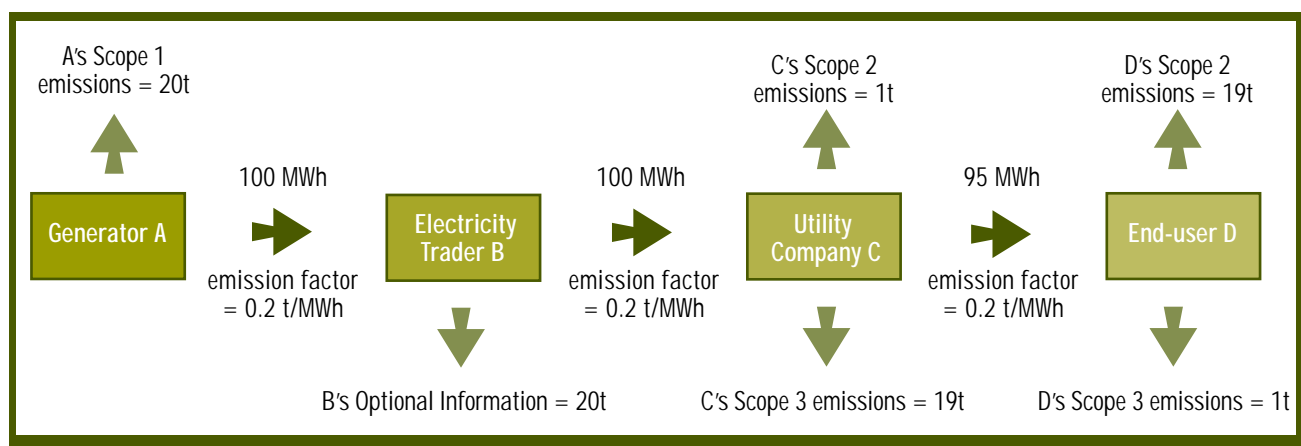
- Extraction and production of purchased materials and fuels⁶
- Transport-related activities
 - Transportation of purchased materials or goods
 - Transportation of purchased fuels
 - Employee business travel
 - Employees commuting to and from work
 - Transportation of sold products
 - Transportation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

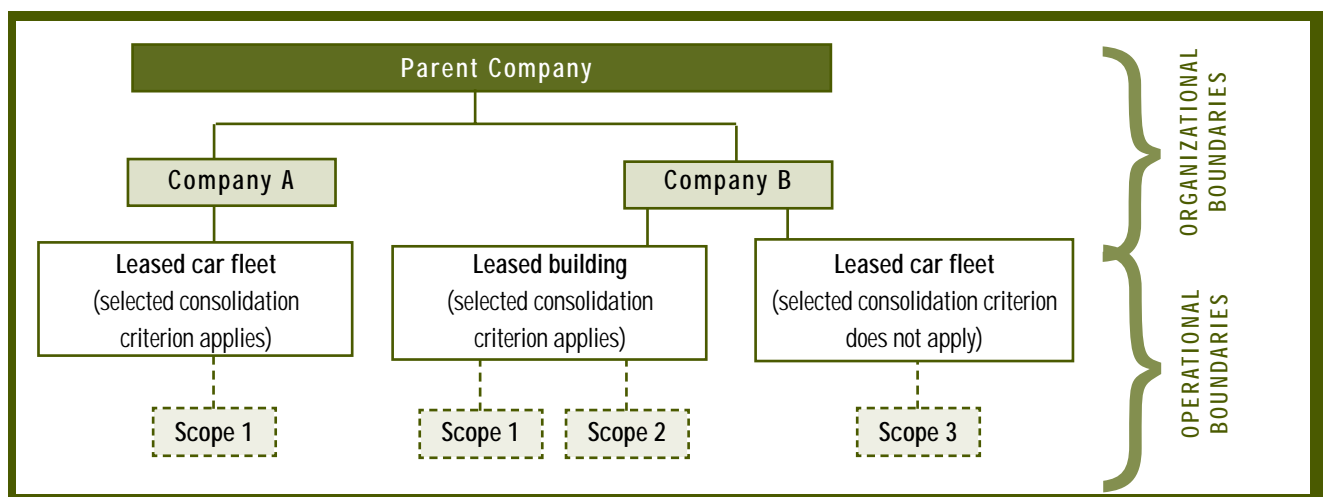
DHL Nordic Express: The business case for accounting for outsourced transportation services

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 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.