Introduction

THE GREENHOUSE GAS PROTOCOL INITIATIVE

The Greenhouse Gas Protocol Initiative is a multi-stakeholder partnership of businesses, non-governmental organizations (NGOs), governments, and others convened by the World Resources Institute (WRI), a U.S.-based environmental NGO, and the World Business Council for Sustainable Development (WBCSD), a Geneva-based coalition of 170 international companies. Launched in 1998, the initiative's mission is to develop internationally accepted greenhouse gas (GHG) accounting and reporting standards for business and to promote their broad adoption.

To date, the GHG Protocol Initiative comprises two separate but linked standards:

- *GHG Protocol Corporate Accounting and Reporting Standard (Corporate Standard),* which provides a step-by-step guide for companies to use in quantifying and reporting their GHG emissions

- *GHG Protocol Project Quantification Standard (Project Standard),* which serves as a guide for quantifying reductions from GHG mitigation projects.

The first edition of the *Corporate Standard*, published in September 2001, enjoyed broad adoption and acceptance around the globe by businesses, NGOs, and governments. Many industry, NGO, and government GHG programs[1] used the *Corporate Standard* as a basis for their accounting and reporting systems. Industry groups, such as the International Aluminum Institute, the International Council of Forest and Paper Associations, and the WBCSD Cement Sustainability Initiative, partnered with the GHG Protocol Initiative to develop complementary industry-specific calculation tools.

Widespread adoption of the *Corporate Standard* can be attributed to the inclusion of many stakeholders in its development and to the fact that it is robust, practical, and builds on the experience and expertise of numerous experts and practitioners. The revised edition of the *Corporate Standard* is the culmination of a 2-year multi-stakeholder dialogue, designed to build on experience gained from using the first edition.

PUBLIC SECTOR PROTOCOL

[1] GHG program is a generic term used to refer to any voluntary or mandatory international, national, sub-national government, or non-governmental authority that registers, certifies, or regulates GHG emissions or removals.

Increasingly, public or government agencies at the local, state and federal level have been called upon to demonstrate leadership by reporting and reducing their greenhouse gas emissions. While the principles in the *Corporate Standard* can provide the basic means by which any organization can create an entity-level GHG inventory, public sector operations entail certain unique elements (including organizational structures, control, tools, freedom of information, and national security) not found in the private sector. To ensure consistency in resulting reported values, as well as interagency coordination, specific details unique to those operations must be agreed upon.

In response to this need, LMI began working with WRI in 2008 to develop GHG accounting and reporting guidance for public sector organizations to as part of the ongoing work of the GHG Protocol Initiative. Like the *Corporate Standard,* this document was developed through a multi-stakeholder process involving over 60 experienced public sector managers, technical experts, and consultants across a range of organizations (see the Contributor's section).

This document, *The Public Sector GHG Accounting and Reporting Protocol* (*Public Sector Protocol*), is a stand-alone document that provides standards and guidance for public agencies at the local/city, state and federal level. It applies the principles and standards of the revised *Corporate Standard* to the unique structures and needs of public agencies. It covers the accounting and reporting of the six greenhouse gases covered by the Kyoto Protocol—carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulphur hexafluoride. It does not modify or directly address the *Project Standard*, nor does it provide guidance for state or community-level inventories. (These types of inventories are based upon boundaries, assumptions and methodology which are significantly different than those referenced and utilized in the *Public Sector Protocol).*

Each chapter is divided into "standards" and "guidance" sections, with the "standards" sections conveying the required elements for each inventory component, and the "guidance" sections elaborating on the context and details of those choices. Together, these sections were designed with the following objectives in mind:

- To help public organizations prepare a GHG inventory that represents a true and fair account of their emissions, through the use of standardized approaches and principles

- To simplify and reduce the costs of compiling a GHG inventory

- To provide the public sector with information that can be used to build an effective strategy to manage and reduce GHG emissions

- To facilitate participation in voluntary and mandatory GHG reporting programs

- To increase consistency and transparency in GHG accounting and reporting among public sector organizations and GHG programs.

All stakeholders benefit from converging on a common standard, which improves the consistency, transparency, and understandability of reported information, making it easier to track and compare progress over time. The common standard facilitates coordination of GHG reporting by multiple entities (such as state and federal organizations), enabling them to comply simultaneously and reduce costs.

The *Corporate Standard* and this *Public Sector Protocol* differ in several ways. Throughout the *Public Sector Protocol*, focus is on the public sector, as opposed to the focus on corporations in the *Corporate Standard*. This shift in focus extends to a number of the examples provided. Discussion details the many variants of public sector situations, and how those variants influence reporting options. Concepts of particular interest to the public sector or those that may have different interpretations are explained where used, for example: reduction credits, value chain, and upstream activities. In addition, several topics that did not necessarily require a specific public sector interpretation but nonetheless warranted greater detail than provided in the *Corporate Standard*, such as the treatment of leased assets, were expanded.

GHG Accounting in the Public Sector

As climate change has become an increasingly urgent concern, government organizations have taken steps to measure, report and reduce their GHG emissions as a key mitigation strategy. Many government agencies at a local, state and federal level have demonstrated leadership in GHG management by participating in voluntary reporting programs such as the Climate Registry, enacting procurement policies related to energy efficiency, and engaging where possible in emissions trading programs.

In addition to voluntary actions, government bodies are also being called upon via legislation or executive order to track and report their GHG emissions. At present, no economy-wide reporting requirements oblige comprehensive public sector GHG accounting. But regional programs such as the Regional Greenhouse Gas Initiative (RGGI) and state regulations around the United States are beginning to require power producers and other large emitters to submit GHG inventories, including such facilities that are owned or operated by government agencies. In addition, some regulatory schemes, like those in Maryland, require operators of certain types of relatively small equipment to submit emissions statistics as part of the equipment's permitting process.

In short, public sector organizations may choose to conduct inventories to serve a variety of organizational goals, including:

- Demonstrating Leadership
- Identifying energy and cost reduction opportunities

- Participating in mandatory reporting programs.
- Gaining relevant GHG inventory experience to inform public policy design

WHO SHOULD USE THIS STANDARD?

Policymakers, leaders, and managers of public sector agencies at the federal, regional, state, and local levels will find the material in this document to be a useful blueprint for designing and implementing a GHG inventory. The guidance in the *Corporate Standard* includes wording, examples, and assumptions almost exclusively from the private sector. But public agency operations, particularly their decision making regimes, may be more complicated as they involve consideration of the public good, executive policy, regulations, and compatibility with other agencies or governments as well as international agreements.

To provide relevant guidance for these situations, this document draws examples from actual experiences of those who manage GHG accounting programs in the public sector. The underlying assumptions (accountability, public interest, freedom of information, due diligence, etc.) form the basis of decisions a public sector manager makes.

This document also serves as a source of information for policymakers developing new regulations and organization-level GHG management program developers. Though the stakeholder process used to develop it, key concepts based on participants' experiences and insights highlighted GHG program attributes that would serve to streamline the implementation and administration of a GHG management program. However, in some cases such information can only be put to good use by program developers, as opposed to those conducting inventories under established regulations where options may no longer be available.

For example, stakeholders often highlighted costs saved through the coordination of reporting requirements for similar activities (especially energy consumption reports). Program developers may have the ability to design the GHG reporting program so that those who implement the program and conduct the inventories can coordinate data reports so they satisfy requirements of the GHG program and energy reporting programs or other programs.

This *Public Sector Protocol* should not be used to quantify the reductions associated with GHG mitigation projects for use as offsets or credits—the *Project Standard* provides standards and guidance for this purpose.

Relationship to Other GHG Programs

It is important to distinguish between the GHG Protocol Initiative and other GHG reporting or management programs. While the *Public Sector Protocol* has been designed to be program and policy neutral, its core principles adapted from the *Corporate Standard* are consistent and compatible with the vast majority of voluntary reporting programs. The *Public Sector Protocol* focuses only on designing a GHG inventory, including the accounting and reporting of emissions. But it does not require emissions information to be reported to LMI, WRI, WBCSD, or any other organization. In addition, although this standard is designed to develop a verifiable inventory, it does not provide a standard for conducting verification.

However, the GHG Protocol Initiative encourages government agencies at the local, state and federal level to participate in voluntary reporting programs which offer agencies a means of added accountability as well as a platform for exchanging technical information on best practices. Where the *Public Sector Protocol* can offer a rigorous framework for designing a GHG inventory, other reporting programs can specify and assist in data collection, management and technical support. In particular, the Local Government Operations Protocol (LGOP) provides GHG inventory guidance specifically for local governments across the globe and shares compatibility with the core principles in the *Public Sector Protocol.* The LGOP was drafted jointly by ICLEI (the International Council for Local Environmental Initiatives), The Climate Registry and the California Air Resources Board.

Because GHG programs often have specific accounting and reporting requirements, public sector organizations should always check with any relevant programs for any additional requirements before developing their inventory. Conversely, GHG program developers and GHG account managers should explore how reporting requirements for other programs may overlap or complement one another, offering potential efficiencies.

Since the guidance in the *Corporate Standard* has served as the basis for most GHG reporting and trading programs to date, the *Public Sector Protocol* is also compatible with these, including the following organizations (also listed in Appendix C):

- Voluntary GHG reduction programs, e.g., the World Wildlife Fund Climate Savers, U.S. Environmental Protection Agency Climate Leaders, Climate Neutral Network, and Business Leaders Initiative on Climate Change.

- GHG registries, e.g., The Climate Registry, the Eastern Climate Registry, and the World Economic Forum Global GHG Registry.

- National and regional industry initiatives, e.g., the New Zealand Business Council for Sustainable Development, Taiwan Business

- GHG trading programs,[2] e.g., the United Kingdom Emissions Trading Scheme, Chicago Climate Exchange, and European Union Greenhouse Gas Emissions Allowance Trading Scheme.
- Sector-specific protocols developed by a number of industry associations, e.g., the International Aluminum Institute, International Council of Forest and Paper Associations, International Iron and Steel Institute, WBCSD Cement Sustainability Initiative, and International Petroleum Industry Environmental Conservation Association.
- Initiatives established in other countries such as Mexico, China, Brazil, Philippines, and India.
- Mandated compliance schemes, e.g., regional (RGGI, Western Climate Initiative, Midwestern Greenhouse Gas Reduction Accord), many states (e.g., California's AB32, Maryland's Healthy Air Act), and cities who have adopted the Mayor's Climate Protection Center guidelines.

GHG CALCULATION TOOLS

For many public agencies, the calculation methods and tools utilized to complete a GHG inventory may be selected at a technical management level and/or integrated into existing environmental reporting mechanisms. Agencies that join voluntary reporting programs like The Climate Registry will draw upon their online reporting and calcaultion tools. Similarly, ICLEI offers a suite of methods and tools that can be aligned with their Local Government Operations (LGO) Protocol. This *Public Sector Protocol* does not require the use of any particular calculation tool, but does require that all methods, procedures and tools utilized in completing a GHG report are transparently detailed. Additionally, when a comprehensive tool does not exist, estimates and thorough documentation of the assumptions and shortcomings of those estimates may be required. A full list of existing calculation tools can be found in Ch. 6.

To complement the standard and guidance provided here, WRI offers a number of cross-sector and sector-specific calculation tools for free on the GHG Protocol Initiative website (www.ghgprotocol.org). These tools provide step-by-step guidance and electronic worksheets to help users calculate GHG emissions from specific sources or industries. The tools are consistent with those proposed by the Intergovernmental Panel on Climate Change (IPCC) for compilation of emissions at the national level (IPCC, 1996). They have been

[2] Trading programs that operate at the level of facilities primarily use the GHG Protocol Initiative calculation tools.

refined to be user-friendly for non-technical staff and to increase the accuracy of emissions data at an organization level.

REPORTING IN ACCORDANCE WITH THE *PUBLIC SECTOR PROTOCOL*

The GHG Protocol Initiative encourages all public sector organizations—regardless of their experience in preparing a GHG inventory—to use this document. The term "shall" is used in the chapters containing standards to clarify what is required to prepare and report a GHG inventory in accordance with the *Public Sector Protocol*; not to convey a statutory requirement. This is intended to improve the consistency with which the standard is applied and the resulting information that is publicly reported. It also has the advantage of providing a verifiable standard for public sector organizations interested in taking this additional step.

However, when regulatory requirements are not consistent with GHG Protocol, the organization's report must describe the variance from the protocol and reason for it. For example, regulations may require that only three GHGs be measured and reported, whereas the GHG Protocol applies to the six Kyoto GHGs. This variance must be reported.

FREQUENTLY ASKED QUESTIONS

Below is a list of frequently asked questions, with directions to the relevant chapters:

- What goals should I consider when setting out to account for and report emissions? Chapter 2
- How do I deal with complex organizational structures and shared GHG emissions ownership? Chapter 3
- What is the difference between direct and indirect emissions and what is their relevance? Chapter 4
- Which indirect emissions should I report? Chapter 4
- How do I account for and report outsourced and leased operations? Chapter 4, Appendix E
- What is a base year and why do I need one? Chapter 5
- My emissions change with alterations to agency structure. How do I account for these? Chapter 5
- How do I identify and calculate my organization's emission sources? Chapter 6

- What kinds of tools are there to help me calculate emissions? Chapter 6
- What data collection activities and data management issues do my facilities have to deal with? Chapter 6
- What determines the quality and credibility of my emissions information? Chapter 7
- How should I account for and report GHG offsets that I sell or purchase? Chapter 8
- What information should be included in a GHG public emissions report? Chapter 9
- What data must be available to obtain external verification of the inventory data? Chapter 10
- What is involved in setting an emissions target and how do I report performance in relation to my target? Chapter 11

Chapter 1
GHG Accounting and Reporting Principles

STANDARD

As with financial accounting and reporting, generally accepted greenhouse gas (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 an organization's GHG emissions. These principles also permit data to be accurately compared from year to year, and across multiple entities—which is particularly critical for departments or sub-agencies or rolling up or aggregating their inventories to higher organizational units (division, bureau. etc.)

GHG accounting and reporting practices are evolving and are new to many organizations; however, the principles listed below from the *Corporate Standard* 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 organization and serves the decision-making needs of users—both internal and external to the organization.
- 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.

GUIDANCE

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 organization's GHG emissions. Their primary function is to guide the implementation of the *Public Sector GHG Accounting and Reporting Protocol (Public Sector Protocol)*, particularly when the application of the standards to specific issues or situations is ambiguous.

Relevance

For a public organization's GHG report to be relevant means that it contains the information that users—both internal and external to the organization—need for their decision making. An important aspect of relevance is the selection of an appropriate inventory boundary, or the selection of what activities fall under a given agency's responsibility. Relevance may also be dictated by regulatory requirements stipulate the information to be included or reporting frequency. The choice of the inventory boundary is dependent on the characteristics of the organization, the intended purpose of information, and the needs of the users. When choosing the inventory boundary, a number of factors should be considered:

- Organizational structures: Control (operational and financial), ownership, legal agreements, public-private partnerships, government owned-contractor operated, etc.
- Operational boundaries: On-site and off-site activities, shared facilities, processes, services, and impacts
- Operational context: Nature of activities, geographic locations, sector(s), purposes of information, and users of information.

More information on defining an appropriate inventory boundary is provided in Chapters 2 (Inventory Goals), 3 (Organizational Boundaries), and 4 (Operational Boundaries).

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 *de minimis* 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, and multiple established GHG programs allow for *de minimis* thresholds, the practical implementation of such a threshold is not compatible with the completeness principle. In order to utilize a *de minimis* threshold, the emissions from a particular source or activity would have to be quantified to ensure they were under the threshold. But once emissions are quantified, most of the benefit of having a threshold is lost.

In the context of verification, a "materiality threshold" is often used to determine whether an error or omission is a material discrepancy or not—that is, whether it significantly impacts the final emissions reported in the inventory. This is not the same as a *de minimis* threshold for defining a complete inventory. Instead, organizations need to make a good faith effort to provide a complete, accurate, and consistent accounting of their GHG emissions. For cases where certain emissions have been excluded, or estimated at an insufficient level of quality (e.g., due to insufficient data), 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(Managing Inventory Quality) and 10 (Verification of GHG Emissions).

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 7 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.

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 organization. The consistent application of accounting approaches, inventory boundary, and calculation methodologies is essential to producing comparable GHG emissions data over time, and among inventories from other reporting organizations. 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 justified, documented, and disclosed.

More information on consistency is provided in Chapters 5 (Tracking Emissions Over Time) and 9 (Reporting Emissions).

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 organization 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 (Reporting Emissions) and 10 (Verification of GHG Emissions).

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 (Managing Inventory Quality).

Chapter 2
Organizational Goals and Inventory Design

GUIDANCE

While public agencies at a local/city, state and federal level may have various reasons for compiling a GHG inventory, public sector managers frequently cite the following four goals:

1. Demonstrating leadership
2. Identifying energy and cost reduction opportunities
3. Participating in mandatory reporting programs
4. Gaining relevant GHG inventory experience to inform public policy design

Public organizations generally want their GHG inventory to be capable of serving multiple goals. It therefore makes sense to design the process from the outset to provide information for a variety of different users and uses—both current and future. The *Public Sector Protocol* has been designed as a comprehensive GHG accounting and reporting framework to provide the information building blocks capable of serving most organizational goals (see Table 2-1). Thus the inventory data collected according to the *Public Sector Protocol* can be aggregated and disaggregated for various organizational and operational boundaries and for different geographic scales (country, state, facility, bureau, field office, etc.).

Public sector managers should be aware that many government organizations may already be collecting, managing, and reporting data and other information that is essential for GHG accounting. For example, federal agencies track and report energy and fuel use and reductions as required by Executive Order 13423. It is important that such existing efforts be leveraged to maximize efficient reporting and to avoid duplication of effort, overlaps, gaps, or conflicts in reporting requirements.

Table 0-1. Organizational Goals Served by GHG Inventories

Demonstrating leadership • Voluntary public reporting of GHG emissions and setting GHG reduction targets • Participation in GHG reporting programs (ex: The Climate Registry) • Green procurement policies (ex: Energy Star)
Identifying energy and cost reduction opportunities • Identifying energy and resource reduction opportunities • Identifying risks associated with GHG constraints in the future • Participating in external cap and trade allowance trading programs
Participating in mandatory reporting programs • Preparing for implementation of mandatory reporting programs • Participating in government reporting programs at the national, regional, state, or local level • Providing information to support "baseline protection" and/or credit for early action • Building experience that allows informed participation in rule-making and standards development
Gaining relevant GHG inventory experience to inform public policy design • Developing nuanced, fair regulations through in-house understanding • Acting as a demonstration laboratory for citizens and other organizations • Acting as a resource for other organizations

Appendix C provides an overview of various GHG programs—many of which are based on the *Corporate Standard*. The guidance sections of Chapters 3 and 4 provide additional information on how to design an inventory for different goals and uses.

Identifying GHG Reduction Focus Areas at the National Aeronautics and Space Administration (NASA)

When NASA took on the task of conducting a GHG emissions inventory in 2005, they determined GHG emissions by using existing NASA information systems for: 1) transportation, 2) energy, and 3) materials-chemicals. NASA's GHG emissions inventory indicated that the major GHG sources were from transportation and energy. But because NASA works with material-chemical sources with high global warming potentials (GWP), they conducted a "what if" analysis to see how large the GHG emissions from such sources would have to be to contribute at least 1 percent of its total emissions.

Theoretical calculations were made using SF_6 (which is used in the production and testing of semiconductors, and is the most potent GHG with a GWP 23,900 times that of CO_2). The "what if" analysis reveled that it would be highly unlikely that NASA's material-chemical GHG sources would be greater than 1 percent of its total GHG emissions. From this, NASA determined that the best use of NASA's resources would be to apply them to reduce emissions from transportation and energy sources. Further, applying additional substantial NASA resources toward reducing material-chemical GHG sources would be an unwise use of limited NASA resources.

Demonstrating Leadership

As concerns over climate change grow, NGOs, taxpayers, and other stakeholders are increasingly calling for greater disclosure of GHG information. In response, a growing number of public sector organizations are demonstrating leadership and "walking the talk" by tracking and reporting their performance across a wide range of environmental issues, including GHG emissions.

Some countries, regions, and states have established GHG registries where government agencies operating within the jurisdiction can report GHG emissions in a public database. Cities and states may report to these programs representing city or state-wide emissions, or only those emissions from government operations. (Note: this *Public Sector Protocol* offers guidance for creating agency-specific inventories, not city or state-wide inventories). Registries may be administered by governments (e.g., the U.S. Environmental Protection Agency's (EPA) Climate Leaders Program, and U.S. Department of Energy (DOE) 1605b Voluntary Reporting Program), NGOs (e.g., The Climate Registry), or industry groups (e.g., World Economic Forum Global GHG Registry). Many GHG programs also provide help to organizations setting voluntary GHG targets. Several government organizations, such as the Washington State Department of Ecology, the City of Greenville, SC, and the US Postal Service are members of The Climate Registry, while National Renewable Energy Laboratory is a Climate Leader's Partner.

Most voluntary GHG programs permit or require the reporting of direct emissions from operations (including all six GHGs), as well as indirect GHG emissions from purchased electricity. A GHG inventory prepared in accordance with the *Public Sector Protocol* will usually be compatible with most requirements (Appendix C provides an overview of the reporting requirements of some GHG programs). However, since the accounting guidelines of many voluntary programs are periodically updated, organizations planning to participate are advised to contact the program administrator to check the current requirements.

In addition to voluntary reporting, some public sector organizations have begun to participate in or purchase offsets from voluntary trading programs, as a means to meet citizens' demands and to demonstrate leadership. Several municipalities, such as Boulder, CO, Chicago, IL, and Fargo, ND, as well as states such as Illinois and New Mexico are members of the CCX and have committed to making specific emissions reductions. Similarly, the U.S. House of Representatives is purchasing offsets from the CCX to achieve a carbon neutral emissions status. In addition internal GHG trading programs, such as the one implemented by BP across its 150 operating units to meet an organization-wide emissions cap on emissions, are being considered as a cost-effective option for meeting agency or organization-wide goals.

Denver, Colorado: The balanced energy capital of the west

Denver is transitioning to an energy mix that is dominated by cleaner fuels such as natural gas, wind and solar, and implementing higher energy efficiency standards which will reduce GHG emissions and bring many additional benefits, including improved air quality, lower energy bills, and reduced dependence on foreign oil supplies. The local economic strategy focuses on both the supply and demand sides of a complex energy challenge.

On the supply side, Denver continues to be a world leader in solar research and the hub of natural gas exploration and development throughout the Rockies. With an average of 300 sunny days per year, Denver has the 5th best solar potential in the country. The city is doing its part to overcome barriers to widespread solar technology adoption. Through its "Solar Cities Partnership," Denver will fundamentally change the energy market in the city by establishing solar as a mainstream energy resource option.

More recently, Denver added wind energy and incentives for individual applications through legislation passed by Colorado voters that requires 10 percent of all electricity produced to come from renewable sources by 2015. On the demand side, Denver's business community is beginning to pursue more aggressive energy management and efficiency programs.

A cornerstone of Denver's energy management and energy efficiency goals includes the development and implementation of an updated Greenhouse Gas Reduction Plan. The plan was implemented first in 2007, providing a baseline for the city to monitor the emissions impacts of the city's work over time.

emissions trends. The city collects available data—primarily from emissions associated with energy consumption and landfills.

Despite rapid population and economic growth, the synergistic efforts of public agencies, local businesses, nonprofit organizations, and citizens led to a local emissions level just 0.1 percent above 1990 levels in 2007.

Public organizations may be limited in their ability to sell or purchase emissions reduction credits that are generated through a market-based program, and specific legislation may be required to clarify these issues or authorize public organizations to fully participate in a trading program.

Comment [W1]: Add expanded discussion of how market participation is specifically present, or limited, for public agency activity as it relates to their GHG inventory.

GHG trading and offset programs are likely to impose additional layers of accounting specificity relating to which approach is used for setting organizational boundaries; which GHGs and sources are addressed; how base years are established; the type of calculation methodology used; the choice of emission factors; and the monitoring and verification approaches employed. The broad participation and best practices incorporated into the *Corporate Standard* and *Public Sector Protocol* are likely to inform the accounting requirements of emerging programs, and have indeed done so in the past.

Identifying Energy and Cost Reduction Opportunities

Compiling a comprehensive GHG inventory improves a public sector organization's understanding of its emissions profile and an indication of energy use. Many public agencies have found a comprehensive GHG inventory to be a valuable means of evaluating their environmental impact and identifying which emissions (and related energy use) sources are most cost-effective to target for reductions.

In addition to the direct energy and cost savings that are revealed in a GHG inventory, public sector organization may influence GHG emissions upstream (its purchase of supplies and services) and downstream from its activities. In the context of future regulations, significant GHG emissions from these activities may result in increased upstream and downstream costs, prompting backlash from taxpayers and other stakeholders (e.g., Congress, suppliers, regulated entities, partnering public sector agencies). These stakeholders may view significant indirect emissions upstream or downstream of an organization's operations as potential liabilities that need to be managed and reduced. A limited focus on direct emissions from an organization's internal operations may miss major GHG risks and opportunities, while leading to a misinterpretation of the organization's actual GHG exposure.

Environmental Protection Agency (EPA): GHG implications of public services

In addition to the devastating toll on human life, in 2005 Hurricane Katrina left in its wake a wasteland of debris and building materials. To rebuild New Orleans and the surrounding areas, large volumes of materials must be cleared to make way for new construction. However, concerns over landfill capacity and propagation of the aggressive and invasive Formosa termite have lead recovery planners to investigate waste management options other than landfill disposal. The two leading candidates were on-site combustion and mechanical grinding (to reduce volume). Because each option releases a range of harmful particles and pollutants, the EPA is in the process of modeling the impacts of large scale implementation to determine which option is least harmful to human health and the environment. The analysis will cover 65 pollutants, but will not include the operations' GHG emissions. Although GHG impact should not be the primary criteria for this decision, the EPA could factor it in as part of a more robust decision. Further, GHG concerns could spur the development of a modified solution, such as adding energy recovery to the combustion option.

On a more positive note, what gets measured gets managed. Accounting for emissions can help identify the most effective reduction opportunities. This can drive increased materials and energy efficiency as well as the development of new products and services that reduce the GHG impacts of suppliers, public sector customers, and others. This in turn can reduce operational costs, enable more effective use of limited agency budgets, and help distinguish the organization in an increasingly environmentally conscious marketplace. Conducting a rigorous GHG inventory is also a prerequisite for setting an internal or public GHG target and for subsequently measuring and reporting progress.

Participating in Mandatory Reporting Programs

Most mandatory GHG reporting programs established in North America and Europe have thus far targeted facilities in the energy sector above a certain threshold of size (eg, 10,000 metric tons GHGs emitted per year). For example, in Europe, facilities falling under the requirements of the Integrated Pollution Prevention and Control (IPPC) Directive must report emissions exceeding a specified threshold for each of the six Kyoto-regulated GHGs The reported emissions are included in a European Pollutant Emissions Register, a publicly accessible internet-based database that permits comparisons of emissions from individual facilities or industrial sectors in different countries (European Commission Directorate-General for Environment, 2000).

In the United States, similar reporting requirements are currently underway at the state and regional level applying to significant industrial and energy facilities. Upcoming national legislation will seek to gather GHG reports from many of these same facilities, in addition to other sources. For instance, reporting and reduction goals set for the 24 states covered under either the Regional Greenhouse Gas Initiative, the Western Climate Initiative, or the Midwestern Greenhouse Gas Reduction Accord apply primarily to large electricity generating facilities.

Comment [W2]: Contribute state and federal reporting examples here and for potential appendix or other resource?.

In the cases where public agencies own these facilities, they may already be conducting specific GHG emission reports. But increasingly, state governors and federal authorities have issued executive orders (EOs) requiring GHG reporting for state and federal agencies .These orders frequently call on public agencies to demonstrate leadership by reporting emissions and setting reduction goals that have not yet been required of private-sector emitters. For example EO 134232 sets energy and water use reduction goals for federal operations, EO S-20-04 sets energy efficiency goals for California state buildings and EO 07-126 obligates Florida's state government to reduce GHG emissions. EOs may be the initial mechanisms through which many public organizations are required to develop comprehensive GHG inventories.

A credible inventory may help ensure that an organization's early, voluntary emissions reductions are recognized in future regulatory programs. To illustrate, suppose that in 2000 an agency started reducing its GHG emissions by purchasing RECs for wind-generated electricity. If a mandatory GHG reduction program is later established in 2005 and it sets 2003 as the base against which reductions are to be measured, the program might not allow the emissions reductions achieved by the green power purchase prior to 2003 to count toward its target.

However, if an organization's voluntary emissions reductions have been accounted for and registered, they are more likely to be recognized and taken into account when regulations requiring reductions go into effect. For instance, the state of California has stated that it will use its best efforts to ensure that organizations that register certified emission reports with the CCAR receive appropriate consideration under any future international, federal, or state regulatory program relating to GHG emissions.

Gaining Relevant GHG Experience to Inform Public Policy Design

Certain government organizations with policy-making authority may find themselves in a unique role as concerns about GHG emissions arise. The private sector, as well as taxpayers, may find it inconsistent for a public agency to impose regulations for GHG reporting if the public sector (itself a significant emitter) is not participating. To the extent that such organizations have developed in-house understanding and experience with operation under GHG reporting programs, they may be in a better position to influence wise and meaningful rules.

Furthermore, by participating in a reporting regime, the public sector can also act as a demonstration laboratory for developing new methods and efficient procedures that later may be adopted by other organizations. These agencies may be the only ones with sufficient latitude to experiment with different methods. They also are not constrained by the same profit motives and intellectual property concerns as the private sector, so that the experiences gained can be more widely shared.

Taking a lead in public reporting and target setting also serves the additional purpose of being a "testing ground" for policy responses to new scientific advancements. In working for the public good, public agencies may respond to known scientific guidance more readily and may be freer to respond to advances in knowledge of the challenges and opportunities for GHG mitigation ahead of public demands or regulation.This may include producing tools and techniques through research and development funding which are then available broadly. Expertise can also be shared through public forums or open contact with those who request it. Such a broad base of knowledge is rarely available elsewhere. Public sector experience may be subject to vetting that ensures its reliability.

Tata Steel: Development of institutional capacity in GHG accounting and reporting

For Tata Steel, Asia's first and India's largest integrated private sector steel company, reducing its GHG emissions through energy efficiency is a key element of its primary business goal: the acceptability of its product in international markets. Each year, in pursuit of this goal, the company launches several energy efficiency projects and introduces less-GHG-intensive processes. The company is also actively pursuing GHG trading markets as a means of further improving its GHG performance. To succeed in these efforts and be eligible for emerging trading schemes, Tata Steel must have an accurate GHG inventory that includes all processes and activities, allows for meaningful benchmarking, measures improvements, and promotes credible reporting.

Tata Steel has developed the capacity to measure its progress in reducing GHG emissions. Tata Steel's managers have access to online information on energy usage, material usage, waste and byproduct generation, and other material streams. Using this data and the GHG Protocol calculation tools, Tata Steel generates two key long-term, strategic performance indicators: specific energy consumption (Giga calorie/tonne of crude steel) and GHG intensity (tonne of CO_2 equivalent/tonne of crude steel). These indicators are key sustainability metrics in the steel sector worldwide, and help ensure market acceptability and competitiveness. Since the company adopted the *GHG Protocol Corporate Standard*, tracking performance has become more structured and streamlined. This system allows Tata Steel quick and easy access to its GHG inventory and helps the company maximize process and material flow efficiencies.

Chapter 3

Setting Organizational Boundaries

STANDARD

Public sector operations vary in their legal and organizational structures; they include those fully owned and operated by the government, those owned by the government but operated by a contractor or private entity, and public-private partnerships, among others. Table 3-1 demonstrates the range of organizational structures and relationships for public sector organizations, indicating the complexity involved in assigning ownership of GHGs. The complexity of these arrangements means that particular care must be taken when setting boundaries, and thorough documentation is required to ensure transparency.

For the purposes of financial accounting, these organizations are treated according to established rules that depend on the structure of the organization and the relationships among the parties involved. For the purpose of accounting and reporting GHG emissions, when setting organizational boundaries, parent or partner organizations select an approach for consolidating GHG emissions and then consistently apply the selected approach to define the sub-operations that constitute the entire organization.

Two distinct approaches can be used to consolidate GHG emissions for organizational reporting: control and equity share. The control approach can be further subdivided into financial control and operational control. Organizations shall account for and report their consolidated GHG data according to either one of the control approaches or the equity share approach, as presented below. Only one approach can be used to prepare an inventory and that approach must be applied consistently across an organization's operations. If the reporting organization wholly owns all its operations, its organizational boundary will be the same whichever approach is used.[1] For organizations 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). In such cases, organizations may choose to develop multiple inventories using different consolidation approaches.

<u>The Public Sector Protocol recommends operational control as the most generally relevant approach for GHG accounting by the public sector.</u>

[1] The term "operations" is used here as a generic term to denote any kind of organizational activity, irrespective of its organizational, governance, or legal structures.

However, financial control and equity share may have particular value under certain circumstances, as discussed below.

Control Approach

Under the control approach, an organization 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, organizations shall choose between either operational control or financial control criteria.

In most cases, whether an operation is controlled by the organization or not does not vary based on whether the financial control or operational control criteria are used. In making the choice between the two, organizations 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 organization's actual ability to control emissions.

***Operational control*.**

An organization has operational control over an operation if the former or one of its sub-organizations (see Table 3-1 for organizational types and relationships) has the full authority to introduce and implement operating policies at the operation. This criterion is consistent with the current accounting and reporting practice of many organizations that report on emissions from facilities they operate (i.e., for which they hold the operating license). It is expected that except in very rare circumstances, if the organization or one of its sub-organizations 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, an organization accounts for 100 percent of emissions from operations over which it or one of its sub-organizations has operational control.

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

Many criteria can be used to define operational control over a operation, facility or source. Depending on the organization, the following criteria may be used:

- The reporting organization wholly owns the source.
- The reporting organization has the full authority to introduce and implement operational and health, safety and environmental policies (including both GHG- and non-GHG- related policies). In many instances, the authority to introduce and implement operational and health, safety, and environmental (HSE) policies is explicitly conveyed in the contractual or legal structure of the partnership or joint venture. In most cases, holding an operator's license is an indication of the authority to implement operational and HSE policies. However, this may not always be the case.
- The reporting organization has already been directed to report energy consumption data from the operation, facility or source.
- Anything else?

Comment [W1]: What do you think of these criteria? Can you suggest others? Do you think a universal definition of operational control is possible?

Financial control.

The organization 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 or other benefits from its activities.[2] For example, financial control usually exists if the organization has the right to the majority of benefits of the operation, however these rights are conveyed. Similarly, an organization 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 organization and the operation takes precedence over the legal ownership status, so that the organization 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 organization and those held by other parties, is also taken into account. This criterion is consistent with international financial accounting standards; therefore, an organization has financial control over an operation for GHG accounting purposes if the operation is fully consolidated in the organization's financial accounts. If this criterion is chosen to determine control, emissions from joint ventures where partners have joint financial control and joint reporting requirements are accounted for based on the equity share approach (see Table 3-1).

Importantly, having financial control does not automatically mean that a public sector organization also exerts operational control. There may be situations where an organization owns an asset (e.g. a transit fleet), but does not maintain operational control of that asset if, for example, that asset's operations and maintenance have been contracted out.

[2] Financial accounting standards use the generic term "control" for what is denoted as "financial control" in this chapter.

Finally, sometimes an organization can have joint financial control over an operation, but not operational control. In such cases, the organization 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.

Equity Share Approach

Under the equity share approach, an organization 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 an organization 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 organization'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 organization 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 organization's accounting or legal staff to ensure that the appropriate equity share percentage is applied for each joint operation.

Consolidation at Multiple Levels

The consolidation of GHG emissions data will only be consistent if all levels of the organization follow the same consolidation policy. In the first step, the management of the headquarters organization or overarching governing body has to decide on a consolidation approach (i.e., the financial or operational control, or the equity share approach). Once an organization-wide consolidation policy has been selected, it shall be applied to all levels of the organization.

Applications of the Consolidation Approaches

Table 3-1a shows how different types of public sector organizations should account for GHG emissions depending on the consolidation approach chosen. Notably, various mechanisms exist for transferring land rights to or from public sector organizations, and Table 3-1b shows how these transfers should be accounted for.

Comment [W2]: We would like to present several visual diagrams illustrating the application of different consolidation approaches for different types of public sector organizations. If necessary, we will provide generic examples, but we would prefer some real-life examples too.

Table 3-1a. Organization Types and Consolidation Approaches

Type of organization	Definition	Example	Accounting for GHG emissions: Based on financial control	Based on operational control	Based on equity share
GOGO	Government-owned/government operated facility where the government owns and operates all activities[a]		100%	100%	n/a
GOCO	Government-owned/contractor-operated facility owned by a government agency, but operated in whole or part by private contractors[a]		100%	0%	n/a
GOPO	Government-owned/privately-operated facility where the government has leased all or part of its facility to a private operator for its operation and profit[a]		100%	0%	n/a
COCO	Contractor owned/contractor operated facility that provides goods and/or services to a federal agency under contract		0%	0%	n/a
COCO(E)	Same as COCO. However, the contractor may be furnished government equipment to manufacture a product or provide a service		100% of emissions from equipment	0%	n/a
POGO	Privately-owned/government-operated facility where the government leases buildings or space for its operations[a]		0%	100%	n/a
Jointly operated government operations	Government facilities owned and operated by multiple government entities		% Ownership	Varies[b]	% Ownership
Quasi-governmental	A hybrid organization assigned attributes of both governmental and private entities[c]		% Ownership	Varies[b]	% Ownership
Public-Private Partnership	Partnerships in which a government organization and private entity contribute various amounts of real property, financial capital, and borrowing ability for the purpose of establishing operating capacity		% Ownership	Varies[b]	% Ownership
Other					

Comment [W3]: Could the group please identify examples for these types of organizations?

Type of organization	Definition	Example	Accounting for GHG emissions		
			Based on financial control	Based on operational control	Based on equity share
Public sector organizations may be responsible for the environmental remediation of private sites, particularly if the site owner cannot be identified or compelled to undertake the remediation. GHG emissions from fuel and electricity use at these sites may be substantial.			0%	100%	n/a

Comment [W3]: Could the group please identify examples for these types of organizations?

Source: Adapted from "The Yellow Book: Guide to Environmental Enforcement and Compliance at Federal Facilities," EPA 315-B-98-001, February 1999.

[a] Here, "government" means the distinct organization within a governmental structure conducting a GHG inventory.

[b] The percentage would depend on contractual or operational arrangements between the partners, or on legislative directives.

[c] In the quasi-governmental designation, the Congressional Research Service (CRS) includes: Quasi Official Agencies, Government Sponsored Entities, Federally Funded Research and Development Centers, Agency-Related Nonprofit Organizations, Venture Capital Funds, and Congressionally Chartered Nonprofit Organizations among others. See "The Quasi Government: Hybrid Organizations with Both Government and Private Sector Legal Characteristics," CRS, February 2007.

Table 3-1b. Accounting for the Transfer of Land Use Rights.

Type of arrangement	Definition	Example	How the GHG emissions from the land concerned are accounted for by the public sector organization		
			Based on financial control	Based on operational control	Based on equity share
Permit	The public sector organization grants a permit to a private party for the use of government land	See Box…	100%	0%	n/a
Withdrawal from Public Use	The public sector organization receives a permit to use land of another government agency for up to 20 years administratively, as long as the intended use does not involve destruction of the land (i.e., military uses, dams)		0%	100%	n/a
Grant	The public sector organization bestows a grant permanently authorizing the use of a given right-of-way. Grants usually involve a single payment for the land or transfer of land use rights.		0%	0%	n/a

Comment [W4]: Could the group please identify examples for these arrangements.

Comment [W5]: Could the Forest Service facilities and recreation divisions offer case studies on permits for land use by private parties?

GUIDANCE

When planning the consolidation of GHG data, it is important to distinguish between GHG accounting and GHG reporting. GHG accounting concerns the development of GHG inventories -- that is, the consolidation of GHG emissions from operations for which an organization is responsible and linking the data to specific operations, sites, geographic locations, 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.

An organization must consider its reporting objectives carefully before designing its GHG accounting and reporting systems. For instance, achieving emissions reductions frequently depends on an understanding of GHG emissions at a finely disaggregated level, so GHG reports would need to be sufficiently detailed to allow the identification of emission reduction opportunities. In addition, public organizations may have several goals for GHG reporting, e.g., regulation-based reporting requirements, demonstrating leadership or responsibility for the public interest, or emissions trading programs (see Chapter 2). Therefore, it is important to ensure that GHG accounting systems are 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 organizations with maximum flexibility to meet a range of reporting requirements.

Which approach is most suitable?

The *Public Sector Protocol* recommends operational control as the most appropriate consolidation approach for public sector activities. This is because the approach will most accurately represent the emission sources that public sector organizations can influence. Similarly, it provides a more transparent basis for the design of government policies that hold individual organizations accountable for their emissions and that mandate emissions reductions.

Nonetheless, the financial control and equity share approaches may be applicable to certain public sector organizations, such as public-private partnerships, quasi-governmental agencies, or joint international partnerships where ownership boundaries can be clearly delineated. Examples may include:

- Port authorities?
- Others?

Comment [W6]: The draft would still benefit from clear examples of when the financial control or equity share approaches should be used in addition to or instead of the operational control approach. Can the group identify any?

In such circumstances, inventory reporting goals may require different data sets, and the reporting organization may need to account for its GHG emissions using both the equity share and a control approach.

In general, organizations should choose a consolidation approach that is best suited to their operational activities, organizational goals, and GHG accounting and reporting requirements. Examples of how such considerations may drive the selection of an approach include the following:

- *Reflection of commercial reality*. An organization that derives an economic profit from a certain activity arguably should take ownership for any GHG emissions generated by the activity. This is achieved by using the equity share approach, which 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 an organization's business activities, but have the advantage that an organization takes full ownership of all GHG emissions that it can directly influence and reduce.

- *Government reporting and emissions trading programs*. Government regulatory programs need to monitor and enforce compliance. Since compliance responsibility generally falls to the operator (not equity holders or the organization that has financial control), governments 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., RGGI allocates 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 organization that has financial control over the operation, or in rare circumstances holds an equity share in 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, organizations 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, an organization that is an equity shareholder in an operation but has no financial control might face demands by the organizations 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 an organization creates through joint operations, the same consolidation rules 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 are more appropriate because 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 because it can be difficult and time consuming to collect GHG emissions data from joint operations not under the control of the reporting organization. Organizations 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*. Organizations might find it difficult to demonstrate completeness of reporting when the operational control criterion is adopted because there are unlikely to be any matching records or lists of financial assets to verify the operations.

Reporting Goals and Level of Consolidation

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

Comment [W7]: Add definition of facility to glossary: "Any property, plant, building, structure, stationary source, stationary equipment or grouping of stationary equipment or stationary sources located on one or more contiguous or adjacent properties, in actual physical contact or separated solely by a public roadway or other public right-of way, and under common operational or financial control, that emits or may emit any greenhouse gas."

Comment [W8]: Would be good to highlight all terms found in the glossary

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

- Government reporting and trading programs which require that data be consolidated within certain geographic and operational boundaries (e.g., the National Parks Service conducts inventories for all activities within park boundaries). This can become complex when organizations are required to report to multiple entities (e.g., emissions data from one site may need to feed into accounts for state, national, or organization-level reports).

- The organization's own willingness to publicly account for its emissions to a wide array of stakeholders through voluntary public reporting; this may involve consolidating organization-wide GHG data to show the emissions of its entire scope of activities, or consolidating function-specific emissions such as those related to transportation. It may also involve consolidating emissions from within a fence line to demonstrate site-level emissions.

Developing inventories and managing data to facilitate consolidation at these various levels may be particularly important for entities from different parent organizations that share facilities and for organizations that are geographically dispersed. For example, military installations may host activities from multiple departments, such as the Army and Air Force; organizational boundaries may need to be selected and emissions accounted for to allow for consolidation at both the installation and department level.

Double Counting

When two or more organizations hold interests in the same joint operation and use different consolidation approaches (e.g., in a public-private partnership where Government Agency A follows the financial control approach while Company B uses the equity approach), emissions from that joint operation could be double counted or not counted at all. This may not matter for voluntary reporting as long as there is adequate disclosure from the company on its consolidation approach. However, double counting or omitting emissions needs to be avoided in trading schemes and mandatory government reporting programs. Entities developing GHG reporting programs must address this issue.

Contracts That Cover GHG Emissions

To clarify ownership (rights) and responsibility (obligations) issues, organizations 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, organizations may opt to describe the contractual arrangement and include information on allocation of GHG related risks and obligations in their GHG accounts (see Chapter 9). In some situations, public sector organizations may choose to include language that clarifies ownership and responsibilities regarding GHG emissions and accounting in the contracts they develop with private businesses.

Treatment of Exceptional, Multi-agency Activities

What about multi-agency responses to unplanned, complex operations undertaken in response to emergencies (e.g., fires and other natural disasters)? Can the PSP sensibly define the implications of these events for organizational and operational boundaries? What are the implications? Do you have case studies?

Comment [W9]: Does the group have any comments here?

Leasing Arrangements

How GHG emissions associated with leased assets are accounted for depends on which consolidation approach is utilized and the lease type. The particular combination of consolidation approach and lease type may impact whether emissions are considered to be direct or indirect, and thus required or optional for reporting purposes. Chapter 4 defines direct and indirect emissions. Appendix E provides detailed guidance for categorizing emissions associated with leased assets.

Chapter 4
Setting Operational Boundaries

STANDARD

Once an organization has established its organizational boundaries it then sets its operational boundaries. The established organizational and operational boundaries together constitute an organization's inventory boundary.

Setting operational boundaries involves identifying emission sources and then categorizing these sources in two steps:

1. Categorization as either direct or indirect. Direct GHG emissions come from sources that are owned or controlled by the reporting organization. Indirect GHG emissions are those that are a consequence of the activities of the organization, but that occur at sources owned or controlled by another organization or company.[1] What is classified as direct or indirect depends on the consolidation approach (equity share or control) selected for setting the organizational boundary (see Chapter 3). Figure 4-1 shows the relationship between the organizational and operational boundaries of an organization.

2. Categorization by scope. All direct emission sources are classified as scope 1, but indirect emission sources are classified as either scope 2 or scope 3. Public sector organizations shall separately account for and report on scopes 1 and 2 at a minimum.

Such categorization improves transparency, reduces the risk of double counting and facilitates the more effective management of GHG risks and opportunities along an organization's value chain. Even without any policy drivers, accounting for GHG emissions along the value chain may reveal potential for greater efficiency and lower costs. Indeed, indirect emissions reductions may be more cost-effective than scope 1 reductions, and so accounting for indirect emissions can help identify where to allocate limited resources in a way that maximizes GHG reductions and reduces operational costs. Finally, emissions reductions along the value chain support public

Comment [W1]: Can the group think of a good example of this from the Public Sector?

[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 nitrogen oxide (NO_x), non-methane volatile organic compound, and carbon monoxide.

sector organizations' efforts to protect the public good by reducing overall GHG emissions.

Figure 4-2 provides an overview of the relationship between the scopes and the activities that generate direct and indirect emissions along an organization's value chain.

Figure 0-1. Organizational and Operational Boundaries of an Organization

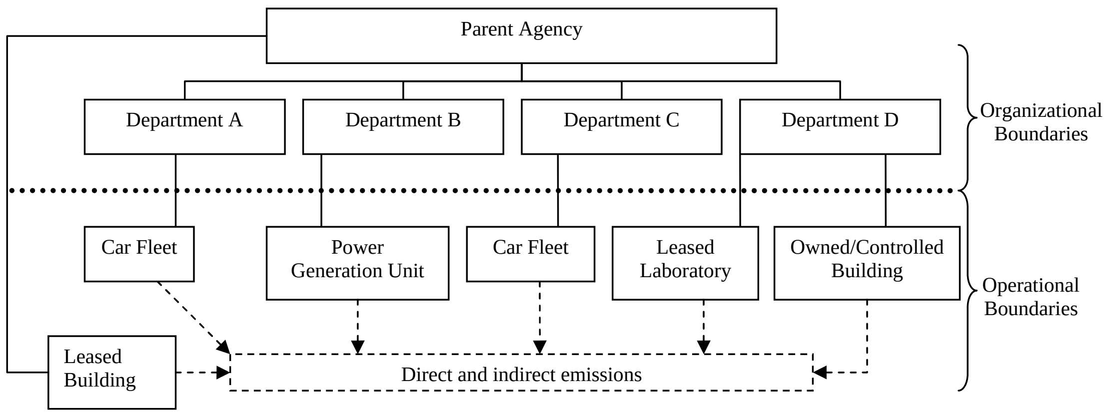
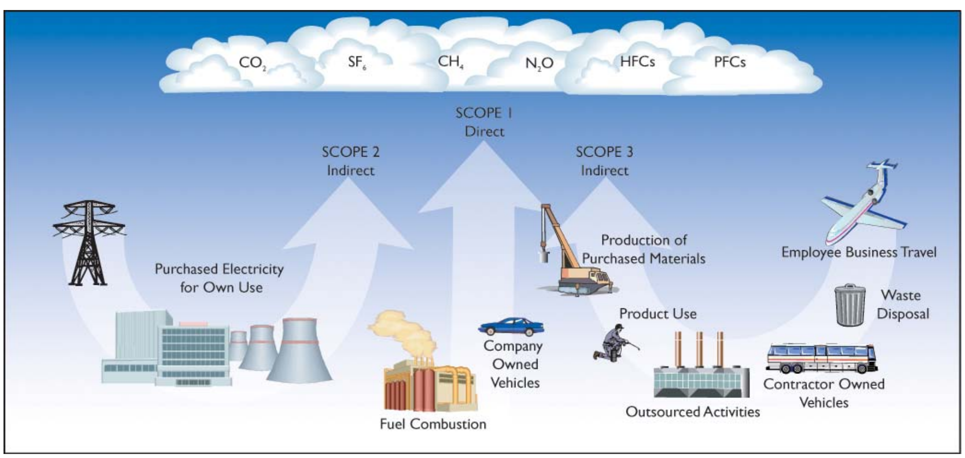


Figure 0-2. Overview of Scopes and Emissions across Activities



Adopted from NZBCSD, 2002.

Scope 1: Direct GHG Emissions

Direct GHG emissions come from sources owned or controlled by the organization. For example, emissions from combustion in owned or controlled boilers, furnaces, vehicles, or emergency generators, and emissions from chemical production in owned or controlled process equipment are scope 1 emissions.

Direct CO_2 emissions from the combustion of biomass or biofuels shall not be included in scope 1 but shall be reported separately. This is because these emissions are assumed to be climate neutral, as the CO_2 will eventually be taken up by vegetation through photosynthesis (see Chapter 9 and Appendix B).

GHG emissions not covered by the Kyoto Protocol, e.g., chlorofluorocarbons (CFCs) and NO_x, 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 electricity[2] consumed by the organization. Purchased electricity is electricity purchased or otherwise brought into the organizational boundary of the organization. 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 organization, but come from sources not owned or controlled by the organization. Some examples of scope 3 activities are extraction and production of purchased materials, transportation of purchased fuels and employee commuter travel.

GUIDANCE

The operational boundary is decided at the administrative headquarters level, and it is then uniformly applied to identify and categorize direct and indirect emissions at each operational level.

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[2] The term “electricity” is used in this chapter as shorthand for electricity, steam, and heating/cooling.

Organizations may further subdivide emissions data within scopes where this aids transparency or facilitates comparability over time. For example, they may subdivide data by agency office, program, facility, region, country, routine versus non-routine operations, 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.).

Scope 1: Direct GHG Emissions

Organizations 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 organization:

- Generation of electricity, heat, or steam. These emissions result from combustion of fuels in stationary sources, e.g., boilers, furnaces, turbines, and emergency generators.
- Physical or chemical processing.[3] Most of these emissions result from the 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 (other than biofuels, see Chapter 9) in organization-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; HFC emissions from the use of refrigeration and air conditioning equipment; and methane leakages from gas transport.
- Less common but still significant, direct emissions may include those from on-site landfills and incinerators, laboratory activities, munitions firing, and organization-specific activities (such as space shuttle launches).

[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.

- Public sector organizations frequently operate their own equipment, such as remedial systems or emergency equipment, on privately-owned facilities. In these cases, the associated GHG emissions are direct.

Again, CO_2 emissions from the combustion of biomass or biofuels are not accounted for as direct, even though they may come from sources that are owned by the reporting organization. Instead, these emissions are accounted for and reported outside of the scopes. However, the CH_4 and N_2O emissions from biomass or biofuel combustion are accounted for as direct.

SALE OF OWN-GENERATED ELECTRICITY

Emissions associated with the sale of own-generated electricity to another organization are not deducted or netted from scope 1. This treatment of sold electricity is consistent with how other sold GHG intensive products are accounted for, 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 or transfer of own-generated electricity may additionally be reported in optional information (see Chapter 9).

Scope 2: Electricity Indirect GHG Emissions

Organizations report the emissions from the generation of purchased electricity that is consumed in their owned or controlled equipment or operations as scope 2. Scope 2 emissions are a special category of indirect emissions. For many organizations, 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 organizations to assess the risks and opportunities associated with changing electricity and GHG emissions costs. Another important reason for organizations to track these emissions is that the information may be needed for some GHG programs.

Organizations can reduce their use of electricity by investing in energy efficient technologies and energy conservation. Additionally, emerging green power markets provide opportunities for some organizations to switch to less GHG-intensive sources of electricity.[4] Organizations can also install an efficient on-site co-generation plant, particularly if it replaces the purchase of

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[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.

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 Table 4-2).

Table 0-1. Electricity Balance

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

Consistent with the scope 2 definition, emissions from the generation of purchased electricity consumed during T&D are reported in scope 2 by the organization 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.

This approach ensures that there is no double counting within scope 2 since only the T&D utility company accounts for indirect emissions associated with T&D losses in scope 2. Another advantage 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 an organization’s electricity provider (e.g., exploration, drilling, flaring, and 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.”

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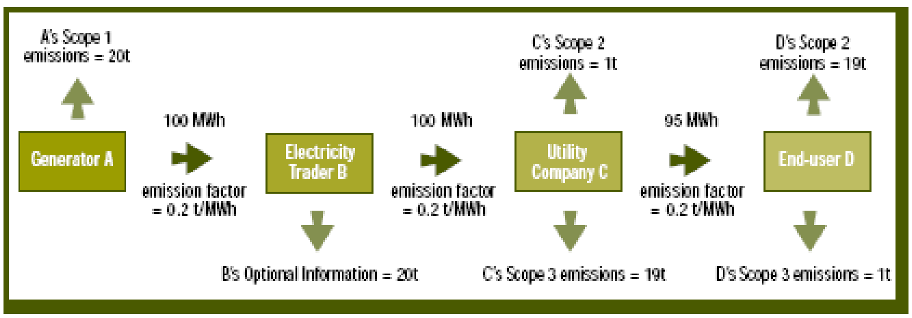
[5] A T&D system includes T&D lines and other T&D equipment (e.g., transformers).

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 from the generation, sale, and purchase of electricity are accounted for.

Example one (Figure 4-3): Company A is an independent power generator that owns a power generation plant. The power plant produces 100 megawatts per hour (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 organization C, a public utility that owns or controls the T&D system. Organization C consumes 5 MWh of electricity in its T&D system and sells the remaining 95 MWh to organization D. Public sector organization 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. Organization 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 4-3 shows the accounting of emissions associated with these transactions.

Figure 0-3. GHG Accounting from the Sale and Purchase of Electricity



Example two: Public sector organization D installs a co-generation unit and sells surplus electricity to a neighboring Organization E for its consumption. Organization 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 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.

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

SCL, Seattle's municipal utility company, sells electricity to its end-use customers that is 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 *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 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 that are doing their own emissions inventory.

Scope 3: Other Indirect GHG Emissions

Scope 3 is optional, but provides an opportunity to be innovative in GHG management. Organizations may want to focus on accounting for and reporting activities that are relevant to their organizational mission and goals, and for which they have reliable information. Because public sector organizations make extensive use of contractors to conduct work for them, scope 3 emissions for the public sector may be quite significant. The public sector has opportunities to influence its scope 3 emissions, so accounting for them will highlight opportunities to reduce overall GHG emissions.

Since organizations have discretion over which categories they choose to report, scope 3 may not be comparable across organizations. This section provides an indicative list of scope 3 categories and includes case studies on some of the categories.

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

- Extraction and production associated with purchased materials and fuels.[6]
- Transport-related activities
  - Transportation of purchased materials or goods
  - Upstream transportation of purchased fuels
  - Employee business travel (not in the organization's vehicle)
  - Employee commuting to and from work
  - Transportation of waste (by a contracted service).
- 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 a utility)
  - Generation of electricity that is consumed in a T&D system (reported by end user).
- Leased assets and outsourced activities—emissions from such contractual arrangements are only classified as scope 3 if the selected consolidation approach (equity, operational control, or financial control) does not apply to them. Clarification on the classification of leased assets should be obtained from the organization's accountant (see the subsection on leases below).
- Waste disposal
  - Disposal of waste generated in operations
  - Disposal of waste generated in the production of purchased materials and fuels

[6] "Purchased materials and fuels" are those purchased or otherwise brought into the organizational boundary.

- Disposal of purchased or 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, four general steps can be articulated:

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. Organizations usually face choices on how many levels upstream and downstream to include in scope 3. Consideration of the organization's inventory or mission, and relevance of the various scope 3 categories guides these choices.

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

    - They are large (or believed to be large) relative to the organization's scope 1 and scope 2 emissions

    - They contribute to the organization's GHG risk exposure

    - They are deemed critical by key stakeholders (e.g., feedback from constituents, suppliers, taxpayers, or legislators)

    - Potential emissions reductions could be undertaken or influenced by the organization.

    The following examples may help decide which scope 3 categories are relevant to the organization:

    - Outsourced or contracted activities are often candidates for scope 3 emissions assessments. It may be particularly important to include these when an activity which previously contributed significantly to an organization's scope 1 or scope 2 emissions is outsourced.

    - If GHG-intensive materials are involved in the production of a significant amount of the supplies and materials used for an organization's activities, it may want to examine whether there are opportunities to reduce consumption of the product or to substitute with less GHG-intensive materials.

- Organizations whose work involves a significant amount of employee business travel may want to report on related emissions.

3. *Identify partners along the value chain*. Identify any partners that contribute potentially significant amounts of GHGs along the value chain (e.g., constituents, suppliers and 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 is often difficult and may only be considered if data are of reliable quality.

Scope 3 Emissions at National Parks

The National Parks collectively receive over 250 million visitors each year. In most cases, these visitors travel within the park in their vehicle. For parks participating in the Climate Friendly Parks (CFP) Program—a joint program between EPA and the National Park Service—this means that a significant amount (often greater than 90 percent) of the GHG emissions that occur within park boundaries result from visitor vehicle travel. Emissions from visitor vehicle travel are considered scope 3 emissions because they occur as a consequence of the activities of the park, but are not from sources directly owned or controlled by the park. In addition to visitor vehicle travel, significant scope 3 emissions also occur inside park boundaries through a range of activities from contractors to concessions, from commercial aircraft to cruise ships.

National Parks have the direct ability to affect emissions from their own facilities and equipment, as well as considerable ability to affect emissions from their visitors, concessions, etc., both within park boundaries and beyond. Because of this, parks that participate in the CFP Program account not only for their own scope 1 and scope 2 sources, but also for many scope 3 sources, such as off-site landfilled solid waste and wastewater treatment, visitor vehicle and other travel, and concession operations, among others. CFP parks work with their surrounding communities, concessions, and contractors to plan ways to reduce emissions, set emission reduction targets, and implement mitigation actions. Through these efforts, CFP parks have found that accounting for, and seeking to reduce, scope 3 emissions provides opportunities for resource sharing, knowledge sharing, and community action.

Emissions Accounting from Employee Business Travel

When calculating the emissions of an organization, it can be easy to overlook the day-to-day activities of office workers as a significant contribution to the total GHG inventory. However, many of those workers are not just sitting behind a desk; they are traveling across town for a meeting, around the country on an investigation, or maybe even around the world on business. Employee business travel can be a significant source of an organization's GHG emissions.

As an example, one section in a federal agency has about 600 employees who take around 3,000 trips per year. If we estimate that each trip involves about 2,000 miles of air travel, we can determine that this section's annual GHG contribution from air business travel alone is over 1,000 metric tons of CO_2. This is the equivalent amount of carbon sequestered from more than 27,000 tree seedlings grown for 10 years.

The transportation sector accounted for 29 percent of the total US energy consumption in 2007, with air travel responsible for over 3 percent of the total. The U.S. Government, projected to spend nearly $15 billion on travel and transport of persons in 2008, has significant purchasing power in this sector. Reporting emissions related to the government employees' travel could provide important data and impetus to modify activities in an effort to reduce overall emissions.

Emissions Accounting for Employee Commuting

Comment [W2]: Public agencies must comply carefully with privacy laws while collecting data for some scope 3 sources (e.g., employee commuting). This box is intended to describe this issue, as well as work-a-rounds involving generic employee commuting estimates. Does the group have any experience here?

Leased Assets and Outsourcing

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, or contracting. If the selected consolidation approach does not apply, the organization may account for emissions from the leased assets, outsourcing, or contracting under scope 3. Specific guidance on leased assets is provided below:

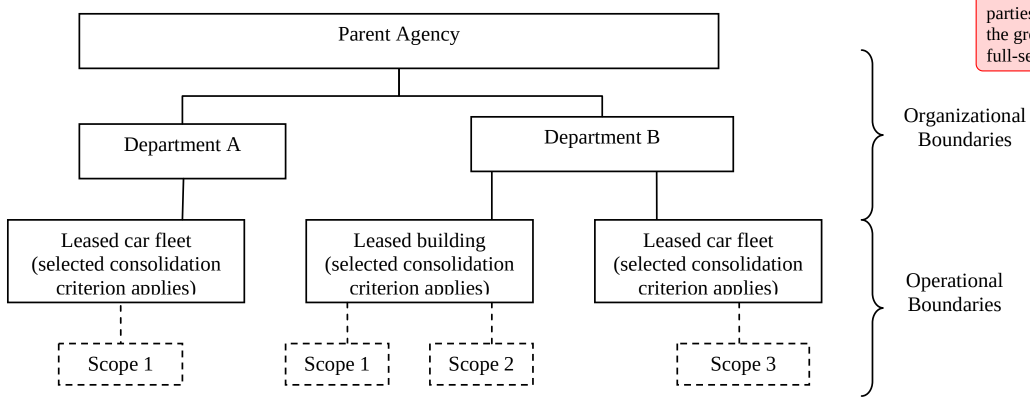
- *Using operational control*. The lessee or lessor only accounts for emissions from leased assets that it operates (i.e., if the operational control criterion applies).

- *Using equity share or financial control*. The lessee or lessor 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).

Guidance on which leased assets are operating and which are finance leases should be obtained from the organization's accountant. In general, in a finance lease, an organization assumes all benefits 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 4-4 illustrates the application of consolidation criteria to account for emissions from leased assets, and Appendix E provides further guidance on accounting for emissions from leased assets.

Comment [W3]: We also intend that this Appendix will provide a range of examples covering the types of leasing arrangements agencies enter into with GSA-type organizations, and how GHG emissions can be accounted for by both parties under these circumstances. Can the group provide examples? Example: full-service lease.

Figure 0-4. Accounting of Emissions from Leased Assets



Double Counting

Concern is often expressed that accounting for indirect emissions will lead to double counting when two different organizations include the same emissions in their respective inventories. Whether or not double counting occurs depends on whether GHG reporting 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 organizational 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.

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

Scopes and Double Counting

The *Corporate Standard* and this *Public Sector Protocol* are designed to prevent double counting of emissions between different organizations within scope 1 and 2. For example, the scope 1 emissions of organization A (generator of electricity) can be counted as the scope 2 emissions of organization B (end user of electricity), but organization A’s scope 1 emissions cannot be counted as scope 1 emissions by company C (a partner organization of A) as long as organization 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 organizations 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.

Organizations do, however, need to ensure that emissions are not double counted when emissions from multiple entities are consolidated within a single GHG inventory. For instance, a public agency may generate electrical power that is then consumed by another agency. The scope 2 emissions of the latter agency should be excluded from the consolidated inventory; otherwise they would be double counted.

In general, 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 organization to exercise ownership of scope 1 or scope 2 emissions.

Chapter 5
Tracking Emissions Over Time

STANDARD

Public sector organizations often undergo significant reorganizations, including the acquisition, elimination, reassignment, and merging of existing programs or subordinate organizations. These changes can alter an organization's fundamental structure, making meaningful comparisons over time difficult. To maintain consistency over time—in other words, to keep comparing "like with like"—historic emission data may have to be recalculated.

Public sector organizations may need to track emissions over time in response to a variety of organizational goals, including:

- Legislative, regulatory, or EO reporting requirements
- Voluntary public reporting
- Establishing GHG targets
- Managing risks and opportunities
- Addressing the needs of taxpayers and other stakeholders.

A meaningful and consistent comparison of emissions over time requires that public organizations set a performance datum with which to compare current emissions. This performance datum is referred to as the base year emissions.[1] For consistent tracking of emissions over time, the base year emissions may need to be recalculated if a public organization undergoes significant structural changes such as reorganization, merger, division, or consolidation where operations are reassigned from one reporting organization to another. The first step in tracking emissions, however, is the selection of a base year.

Choosing a Base Year

Public organizations shall choose and report a base year for which verifiable emissions data are available and specify their reasons for choosing that particular year. Most public organizations select a single year as their base year. However, it is also possible to choose an average of annual emissions over

[1] Terminology for this topic can be confusing. "Base year" differs from "baseline," which is mostly used in the context of project-based accounting. The term base year focuses on a comparison of emissions over time, while a baseline is a hypothetical scenario for what GHG emissions would have been in the absence of a GHG reduction project or activity.

several consecutive years. For example, the CCX Phase I members use average emissions from 1998–2001 as the baseline for tracking reductions. A multiyear average may help smooth out unusual fluctuations in GHG emissions that would make a single year's data unrepresentative of the organization's typical emissions profile.

The inventory base year can also be used as a basis for setting and tracking progress towards a GHG target, in which case it is referred to as a target base year (see Chapter 11).

Recalculating Base Year Emissions

Public organizations shall develop a base year emissions recalculation policy, and clearly articulate the basis and context for any recalculations. If applicable, the policy shall state any "significance threshold" applied for deciding on historic emissions recalculation. "Significance threshold" is a qualitative or quantitative criterion used to define any significant change to the data, inventory boundary, methods, or any other relevant factors. The organization is responsible for determining the "significance threshold" that triggers base year emissions recalculation and to disclose it. The verifier is responsible for confirming the organization's adherence to its threshold policy. The following cases shall trigger recalculation of base year emissions:

- Structural changes in the reporting organization that significantly impact its base year emissions. A structural change involves the transfer of control of emissions-generating activities or operations from one organization to another. While a single structural change might not significantly impact the base year emissions, the cumulative effect of a number of minor structural changes can. Structural changes include the following:
  - Reorganization, division, or consolidation of subordinate organization's emitting activities
  - Outsourcing and insourcing of emitting activities.
- Changes in calculation method or improvements in the accuracy of emission factors or activity data that significantly impact the base year emissions data.
- Discovery of significant errors, or a number of cumulative errors, that are collectively significant.

In summary, base year emissions shall be retroactively recalculated to reflect changes in the organization that would otherwise compromise the consistency and relevance of the reported GHG emissions information. Once an organization has determined its policy on how it will recalculate base year emissions, it shall apply this policy in a consistent manner. For example, it shall recalculate for both GHG emissions increases and decreases.

GUIDANCE

Selection and recalculation of a base year should relate to the organizational goals and the particular context of the organization:

- For the purpose of reporting progress toward voluntary public GHG targets, public organizations may follow the standards and guidance in this chapter.
- A public organization subject to an external GHG program may face external rules governing the choice and recalculation of base year emissions.
- For internal management goals, the organization may follow the rules and guidelines recommended in this document, or it may develop its own approach, which should be followed consistently.

Choosing a Base Year

Public organizations should choose as a base year the earliest relevant point in time for which they have reliable data. Some organizations have adopted 1990 as a base year to be consistent with the Kyoto Protocol. However, obtaining reliable and verifiable data for historical base years such as 1990 can be very challenging. Some organizations will have to use a base year prescribed through legislation, regulation, or executive order. For example, EO 13423 specifies 2003 as the base year for its energy reduction goals for federal agencies.

Some public organizations may require multiple base years due to the cyclical nature of their operations. For example, a government census bureau may acquire GHG-emitting resources (e.g., vehicle fleets and offices) to undertake a periodic census, but then relinquish these resources following the completion of the census. This bureau may therefore need two base years -- one with and one without the census. Other organizations with noncyclical, but highly variable emissions may require the use of an average of emissions over multiple but consecutive years. For example, an emergency response organization may want to create a base year using an average emissions rate across multiple consecutive years to account for unusually large and non-routine activities in any given year. However, most emissions trading and registry programs require a fixed base year policy to be implemented.

In choosing a base year and, more generally, in designing a GHG accounting system, public organizations should chose between fiscal years or calendar years as the basis for reporting. While using the same reporting period for both financial and GHG emissions accounting will reduce the reporting burden, doing so may not be possible. For instance, public sector organizations may have to report their GHG emissions to voluntary or mandatory reporting programs on a calendar year basis, and their financial data on a fiscal year basis. Such issues would need to be addressed early on in the design of a GHG accounting system.

Significance Thresholds for Recalculations

Whether base year emissions are recalculated depends on the significance of the changes. The determination of a significant change may require considering the cumulative effect on base year emissions of a number of small reorganizations (consolidations or divisions). The *Public Sector Protocol* makes no specific recommendations as to what constitutes "significant." However, some GHG reporting programs do specify numerical significance thresholds, e.g., for the CCAR, the change threshold is 10 percent of the base year emissions, determined on a cumulative basis from the time the base year is established.

Base Year Emissions Recalculation for Structural Changes

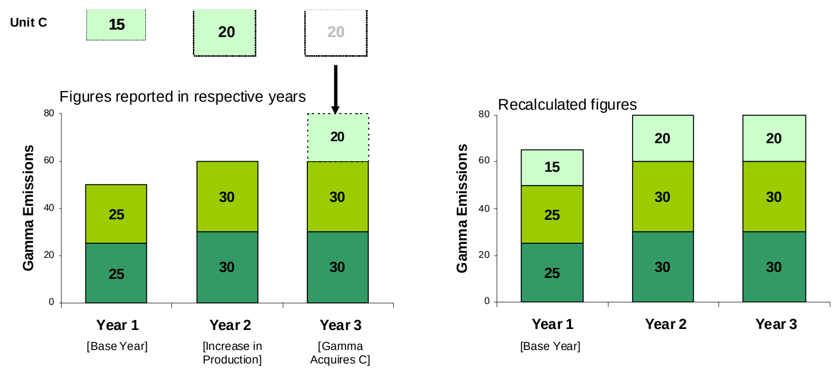
Structural changes trigger recalculation because they merely transfer emissions from one organization to another without any change of emissions released to the atmosphere. For instance, a consolidation or division of subordinate organizations only transfers existing GHG emissions from one public organization's inventory to another. Examples of structural changes that would require the recalculation of base year emissions include:

- The consolidation of school districts.
- Others?

Comment [W1]: Can the group suggest further examples here?

Figures 5-1 and 5-2 illustrate the effect of structural changes and the application of this standard on recalculation of base year emissions.

Figure 0-1. Base Year Emissions Recalculation for Consolidation



Department Gamma consists of two operating units (A and B). In its base year (year one), each operating unit emits 25 tons CO_2. In year two, the department undergoes "organic growth," leading to an increase in emissions to 30 tons CO_2 per business unit, i.e., 60 tons CO_2 in total. The base year emissions are not recalculated in this case. At the beginning of year three, the department is reorganized and acquires operating Unit C from another department. The annual emissions of Unit C in year one were 15 tons CO_2, and 20 tons CO_2 in years two and three. The total emissions of department Gamma in year three, including Unit C, are therefore 80 tons CO_2. To maintain consistency over time, the department recalculates its base year emissions to take into account the acquisition of Unit C. The base year emissions increase by 15 tons CO_2—the quantity of emissions produced by Unit C in Gamma's base year. The recalculated base year emissions are 65 tons CO_2. Gamma also (optionally) reports 80 tons CO_2 as the recalculated emissions for year two.

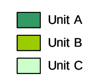
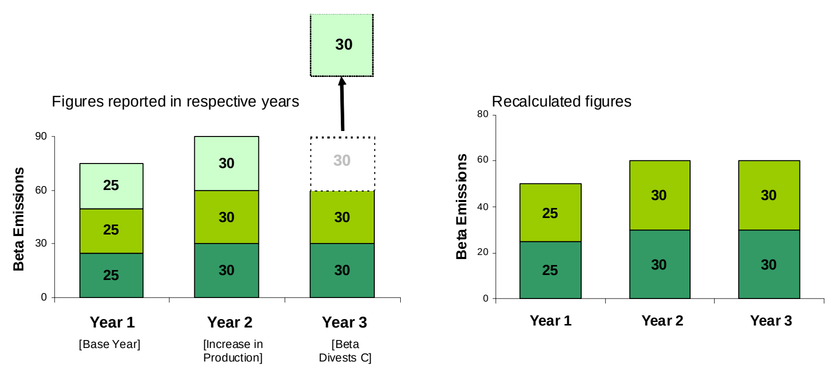
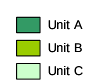


Figure 0-2. Base Year Emissions Recalculation for Realignment of Operations



Department Beta consists of three operating units (A,B, and C). Each operating unit emits 25 tons CO_2 and the total emissions for the department are 75 tons CO_2 in the base year (year one). In year two, the output of the department grows, leading to an increase in emissions to 30 tons CO_2 per operating unit, i.e., 90 tons CO_2 in total. At the beginning of year three, the Department Beta is reorganized and 'loses' operating unit C to another Department. The Department Beta annual emissions are now 60 tons, representing an apparent reduction of 15 tons relative to its base year emissions. However, to maintain consistency over time, the department recalculates is base year emissions to take into account the divestment of operating unit C. The base year emissions are lowered by 25 tons CO_2—the quantity of emissions produced by the operating unit C in the base year. The recalculated base year emissions are 50 tons CO_2, and the emissions of department Beta are seen to have risen by 10 tons CO_2 over the three years. Beta (optionally) reports 60 tons CO_2 as the recalculated emissions for year two.



Timing of Recalculations for Structural Changes

When significant structural changes occur during the middle of the reporting year (fiscal or calendar), the base year emissions should be recalculated for the entire year, rather than only for the remainder of the reporting period after the structural change occurred. This avoids having to recalculate base year emissions again in the succeeding year. Similarly, current year emissions should be recalculated for the entire year to maintain consistency with the base year recalculation. If it is not possible to recalculate in the year of the structural change (e.g., due to lack of data for an acquired organization), it may be done the following year.[2]

Recalculations for Changes in Calculation Method or Improvements in Data Accuracy

A public organization might report the same sources of GHG emissions as in previous years, but measure or calculate emissions differently. For example, an organization might have used a national electric power generation emissions factor to estimate scope 2 emissions in year one of reporting. In later years, it may obtain more accurate region-specific emission factors (for the current as well as past years) that better reflect the GHG emissions associated with the electricity that it has purchased. If the differences in emissions resulting from such a change are significant, historic data are recalculated applying the new data or method.

Sometimes the more accurate data input may not reasonably be applied to all past years, or new data points may not be available for past years. The organization may then have to backcast these data points, or the change in data source may simply be acknowledged without recalculation. This acknowledgment should be made in the report each year to enhance transparency; otherwise, new users of the report in years after the change may make incorrect assumptions about the performance of the organization.

Any changes in emission factor or activity data that reflect real changes in emissions (i.e., changes in fuel type or technology) do not trigger a recalculation.

[2] For more information on the timing of base year emissions recalculations, see the guidance document "Base year recalculation methodologies for structural changes" on the GHG Protocol website (www.ghgprotocol.org).

New York City: Recalculation of base year emissions because of methodological improvements

After producing an initial baseline, New York City has now categorized its emissions into scopes based on the WRI/World Business Council for Sustainable Development's (WBCSD's) *Corporate Standard*, and has revised its methodology for calculating emissions from solid waste. Due to improvements in available data, the City has also updated its emissions coefficients for electricity and steam and its base year for on-road transportation emissions. These various changes have been applied to the City government base year GHG inventory, resulting in adjusted base year figures for the fiscal year 2006 City government analysis. As a result of the adjustments, the City government fiscal year 2006 GHG base year inventory increased 5.9 percent from 3.8 million metric tons (MMT) CO_2-e to 4.1 MMTCO_2-e, an in crease of 0.23 MMT.

Source: Inventory of New York City Greenhouse Gas Emissions, September 17, 2008.

Base Year Anomalies

In tracking GHG emissions from year-to-year, there might be some anomalies that occur and require explanation. Table 5-1 provides three examples of such anomalies, which will be familiar to public sector managers. Appropriate base years in these cases may be difficult to define. Although none of these examples would allow for a recalculation of the base year emissions, they should be considered when determining how to initially select the base. One alternative may be multi-year average base years based on analogous anomalies, but these may be misleading in nearly every year. The justification for selecting the chosen base year and explanation for anomalies such as these should be detailed within the GHG emissions report.

Table 0-1. Anomalous Conditions and Base Year Decisions

➤ Type of anomaly	➤ Definition	➤ Example	➤ Potential solution and implication
Discontinuous	Significant and sudden change (either up or down) in GHG emissions due to a major change in the agency's mission.	NASA's transitional shift from the "Space Shuttle Program" to the "Constellation Program for Human Space Exploration."	Use original base year and recognize that the new mission has lead to increased (or decreased) emissions.
Periodic	Temporary (repeating) increase in GHG emissions due to a foreseen activity change within an agency mission.	U.S. Census Bureau's acquiring new temporary office space and vehicles to conduct the U.S. nation-wide census every 10 years.	Base year consists of two years, one with and one without census. Comparison to the appropriate baseline year shows real increases or decreases.

Table 0-1. Anomalous Conditions and Base Year Decisions

➤ Type of anomaly	➤ Definition	➤ Example	➤ Potential solution and implication
Episodic	Temporary increase in GHG emission due to an unforeseen events outside the agency's control.	U.S. National Forest Service reporting of GHG emissions from wildfires that are larger or greater in number than normal.	Use original base year and recognize that the increase is real, even if temporary. If base year is an anomalously large fire year, this produces apparent decreases that are misleading.

Optional Reporting for Recalculations

Optional information that public organizations may report on recalculations includes the following:

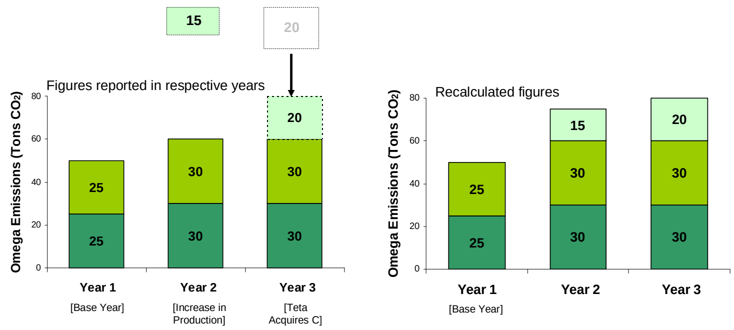
- The recalculated GHG emissions data for all years between the base year and the reporting year
- All actual emissions as reported in respective years in the past, i.e., the figures that have not been recalculated. Reporting the original figures in addition to the recalculated figures contributes to transparency because it illustrates the evolution of the organization's structure over time.

No Base Year Emissions Recalculations for Facilities That Did Not Exist in the Base Year

Base year emissions are not recalculated if the organization makes an acquisition of—or takes back (insources) previously outsourced—operations that did not exist in its base year. There may only be a recalculation of historic data back to the year in which the acquired operations came into existence. The same applies to cases where the organization loses ownership of (or outsources) operations that did not exist in the base year.

Figure 5-3 illustrates a situation where no recalculation of base year emissions is required because the acquired facility came into existence after the base year was set.

Figure 0-3. Acquisition of Operations That Came Into Existence after Base Year Set



Department Omega consists of two operating units (A and B). In its base year (year one), the organization emits 50 tons CO_2. In year two, the organization undergoes organic growth, leading to an increase in emissions to 30 tons CO_2 per operating unit, i.e., 60 tons CO_2 in total. The base year emissions are not recalculated in this case. At the beginning of year three, Omega acquires a facility C from another department. Facility C came into existence in year two, its emissions being 15 tons CO_2 in year two and 20 tons CO_2 in year three. The total emissions of department Omega in year three, including facility C, are therefore 80 tons CO_2. In this acquisition case, the base year emissions of department Omega do not change because the acquired facility C did not exist in year one when the base year of Omega was set. The base year emissions of Omega therefore remain at 50 tons CO_2. Omega (optionally) reports 75 tons as the recalculated figure for year two emissions.

Unit A
Unit B
Unit C

No Recalculation for "Outsourcing or Insourcing" If Previously Reported under Scope 2 or Scope 3

Structural changes due to "outsourcing" or "insourcing" do not trigger base year emissions recalculation if the organization is reporting its indirect emissions from relevant outsourced or insourced activities. For example, outsourcing production of electricity, heat, or steam does not trigger base year emissions recalculation because the *Public Sector Protocol* requires scope 2 reporting. However, outsourcing or insourcing that shifts significant emissions between scope 1 and scope 3 when scope 3 is not reported does trigger a base year emissions recalculation (e.g., when an organization outsources the transportation of products).

In case an organization decides to track emissions over time separately for different scopes, and has separate base years for each scope, base year emissions recalculation for outsourcing or insourcing is made.

Recalculating Base Year Due to Outsourcing

If your organization contracts out activities previously included in your base year emissions estimate, you may need to adjust your base year report to reflect the outsourcing. If you continue to include the emissions associated with the outsourced activities as part of your indirect (scope 2 or scope 3) emissions, you should not adjust your base year emissions. If the emissions associated with the outsourced activities are classified as scope 2, you are required to report these emissions. In meeting this requirement, you avoid the need to adjust your base year emissions to reflect the outsourcing.

If, on the other hand, the outsourced activities are considered to be scope 3 emissions, you can either report these emissions or exclude them from your report. If you choose to exclude them, you must adjust your base year emissions to reflect the outsourcing. Specifically, you should subtract the base year emissions caused by the activities now being outsourced from your previously reported base year emissions to obtain an adjusted base year emissions total. You should *not* adjust your base year report if the outsourced activities did not exist during your base year.

For example, suppose a government agency outsourced waste management services that were previously included in that agency's base year emissions. This agency could then chose to either exclude the scope 3 emissions entirely from its current inventory (and adjust its base year emissions), or report these scope 3 emissions (and not adjust the base year emissions).

Source: The Climate Registry General Reporting Protocol (Version 1.1, May 2008) available on the web at http://www.theclimateregistry.org/downloads/GRP.pdf.

Recalculating Base Year Due to Insourcing

Insourcing is the converse of outsourcing. If you did not include the emissions associated with insourced activities as indirect emissions in your base year report, you must adjust your base year emissions to reflect the insourced activities. To adjust for insourcing, you add the base year emissions for the insourced activities to your previously reported base year emissions. If the activities you are insourcing did not occur in the base year, you should not adjust your base year emissions. Base year emissions should not be adjusted for the insourcing of activities that did not occur in the base year.

For example, suppose that in the base year your organization hired a private delivery service to hand deliver proposals and deliverables to government offices located throughout Washington, DC. Suppose further that you included the delivery service's emissions associated with the delivery of your organization's packages as indirect (scope 3) emissions in your base year report. If, in a subsequent year, your organization terminated its contract with the delivery service and used its own employees and vehicles to make the deliveries, no change in your base year report would be required because the emissions you "insourced" were already included (as indirect emissions) in your base year report. Alternatively, if you did not include the delivery company's emissions in your base year report, upon insourcing the delivery activities you would have to revise your base year report to include the indirect emissions that were subsequently insourced.

However, if in the base year you did not submit any proposals or deliverables to clients in the Washington, DC, area, but you subsequently hired the delivery service and then brought the delivery activities in house, you would not need to adjust your base year report because the insourced activities were not undertaken, either by your organization or the delivery service, in the base year.

Source: The Climate Registry General Reporting Protocol (Version 1.1) available on the web at http://www.theclimateregistry.org/downloads/GRP.pdf.

Comment [W2]: Is the group aware of a common instance of insourcing activity that would clarify when base years should be recalculated for insourcing?

No Recalculation for Organic Growth, Decline, or Closure

Base year emissions and any historic data are not recalculated for organic growth, decline, or closure. Organic growth includes new or increased emissions from new regulatory responsibilities or increased operations. Organic growth does not include subsuming another organization's existing emissions through reorganization. Closures should be considered as reductions in emissions against a baseline. The rationale for this is that organic growth or decline results in an actual change of emissions to the atmosphere and therefore needs to be counted as an increase or decrease in the organization's emissions profile over time

Comment [W3]: We would like to use BRACs as an example of when:
1.Base year emissions should be recalculated (when a base formerly administered by a single agency is now realigned amongst several agencies)
2.Base year emissions should not be recalculated (when a base is simply closed).

Can the group think of examples here? We would also be interested in examples from non-military contexts.

Base Realignment and Closure (**BRAC**)

BRAC is a process of the United States federal government to close excess military installations. …

Chapter 6
Identifying and Calculating GHG Emissions

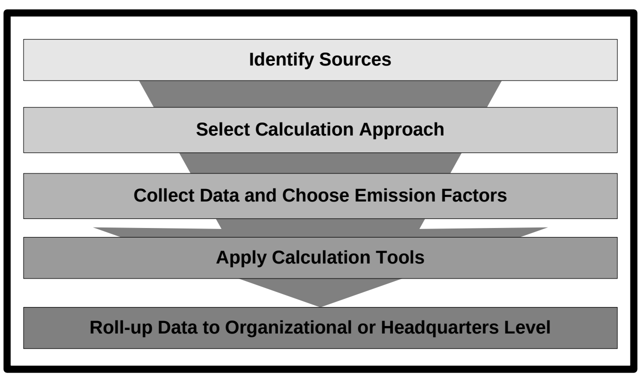
GUIDANCE

Once the inventory boundary has been established, public organizations generally calculate GHG emissions using the following five steps:

1. Identify GHG emissions sources.
2. Select a GHG emissions calculation approach.
3. Collect activity data and choose emission factors.
4. Apply calculation tools.
5. Roll up GHG emissions data to the organizational or headquarters level.

This chapter describes these steps and provides a list of calculation tools commonly used by public sector agencies, including those developed by the GHG Protocol (available on the GHG Protocol Initiative website at www.ghgprotocol.org). This is not a comprehensive list, and government agencies may be directed to use specific calculation tools or reporting programs.

Figure 0-1. Steps in Identifying and Calculating GHG Emissions



Identify GHG Emissions Sources from Government Operations

The first of the five steps in identifying and calculating an organization's emissions as outlined in Figure 6-1 is to identify GHG sources within the organization's boundaries. Direct (Scope 1) GHG emissions from government operations typically occur from the following source categories:

- *Stationary combustion*: combustion of fuels in stationary equipment such as boilers, furnaces, burners, turbines, heaters, incinerators, engines, and flares.
- *Mobile combustion:* combustion of fuels in transportation devices such as automobiles, trucks, buses, trains, airplanes, boats, ships, barges, and vessels.
- *Process emissions:* emissions from physical or chemical processes such as CO_2 from the calcination step in cement manufacturing, CO_2 from catalytic cracking in petrochemical processing, and PFC emissions from aluminum smelting.
- *Fugitive emissions:* intentional and unintentional releases, such as equipment leaks from joints, seals, packing, and gaskets, as well as fugitive emissions from detonation and firing of munitions, rocket firing, coal piles, wastewater treatment, cooling towers, and gas processing facilities.

The GHG Protocol calculation tools are organized on the basis of these categories. Table 6-1 shows a sample of GHG emissions from typical public sector operations. Since most of these are directly related to energy use, organizations may be able to base emissions information on existing energy management system data sets. Such synergies can make GHG reporting less onerous and more cost effective. Appendix D provides an overview of direct and indirect GHG emission sources organized by scopes and industry sectors that may be used as an initial guide to identify major GHG emission sources in public organizations.

Table 0-1. Illustrative Emissions Sources Associated with Public Sector Operations

Emission source	Type	Possible data needs	Potential data source
Buildings (Government-owned, operated or occupied facilities)	S, P, F	1) For stationary combustion sources: amounts of natural gas and other fuels consumed (CO_2, CH_4, and N_2O). 2) For electricity consumption: amount of electricity purchased from the grid (CO_2, CH_4, and N_2O). 3) Amount of imported steam or district heating or cooling (CO_2, CH_4, and N_2O). 4) For refrigeration and heating, ventilation, and air conditioning (HVAC) systems: type of refrigerants, type and quantities of air conditioning (A/C) equipment, total refrigerant charge, and annual leak rates (HFCs and PFCs).	Utility provider that transmits the power source (e.g., investor-owned utility, municipal utility) Accounts payable Property management HVAC maintenance contract manager
Road and marine vehicle and aircraft fleets (Vehicles in agency-managed fleet)	M, F	1) Fuel consumption or mileage data by vehicle, vehicle type, and vehicle year (CO_2, CH_4, and N_2O). 2) For vehicle A/C systems: type of refrigerants, number and type of vehicles in fleet, total refrigerant charge, and annual leak rates (HFCs).	Fleet management Accounts payable
Water and Sewage (Treatment and pumping)	S,P, F	1) See buildings. 2) Information on the volume and composition of water/sewage treated at water/sewage treatment plants (CH_4 and N_2O).	Utility provider that transmits the power source (e.g., investor-owned utility, municipal utility) Accounts Payable Public Works Dept Municipal Utility District (Water District)
Landfill Management	S		
Stationary combustion equipment (including power plants and generators)	S	1) Amount of fuel consumed (CO_2, CH_4, and N_2O).	Bulk Fuel Purchases Maintenance/testing records
Fire Protection (Vehicles, fire suppression systems)	S, M, F	1) See buildings. 2) See fleets. 3) For fire suppression systems: type of suppressants, number and type of vehicles in fleet, total charge, and annual leak rates (HFCs).	Maintenance records Coolant purchase records

Comment [W1]: Need more information here

Table 0-1. Illustrative Emissions Sources Associated with Public Sector Operations

Emission source	Type	Possible data needs	Potential data source
Road Construction (Vehicles, cement, and asphalt production)	S, M, P	1) See buildings. 2) See fleets. 3) Data on cement production. 4) See parks and lands (soils and forests) 5) Traffic lights and other signal/lighting equipment.	
Laboratories	S, F	1) See buildings. 2) Gases for testing: N_2O, HFCs, PFCs.	Bulk Fuel Records
Universities	S, M, F	1) See buildings. 2) See fleets. 3) See generators.	
Parks and lands	S, F	1) See buildings. 2) See fleets. 3) Fish hatcheries: potential N_2O and potential CH_4 from fish food. 4) Soils: CO_2 emissions (and removals) and N_2O emissions. 5) Forests: CO_2 emissions and removals associated with changes in above-ground forest stocks 6) Off-road mobile sources (snowmobiles, lawnmowers, ATVs)	Fleet management
Other (Emissions that may not be captured in above categories)	S, M, F	Examples include portable equipment, lawnmowers, weed-whackers, leaf-blowers, and scissor lifts): fuel consumption, hours of use, and, for fire suppression systems, data necessary to calculate emissions of PFCs.	Dependent on emissions source Maintenance records Air permits

Source: Adapted from http://www.theclimateregistry.org/downloads/State_Government_GHG_Sources.pdf.

Note: S = stationary emissions; M = mobile emissions; P = process emissions; F = fugitive emissions.

IDENTIFY SCOPE 1 EMISSIONS

As a first step, a public organization should undertake an exercise to identify its direct (scope 1) emission sources in each of the four source categories listed above. Process emissions are usually only relevant to certain industry sectors like oil and gas, aluminum, and cement. Public organizations, such as defense facilities, that generate process emissions, or that own or control a power production facility, will likely have direct emissions from all the main source categories. Office-based public organizations may not have any direct GHG emissions except in cases where they own or operate a vehicle, combustion device, or refrigeration and air-conditioning equipment. Often, organizations are surprised to realize that significant emissions come from sources that are not initially obvious (see United Technologies case study).

Identify Scope 2 Emissions

The next step is to identify indirect emission sources from the consumption of purchased electricity, heat, or steam. Almost all public organizations generate indirect emissions due to the purchase of electricity for use in their processes or services.

Identify Scope 3 Emissions

This optional step involves identification of other indirect emissions from an organization’s upstream and downstream activities; for government agencies, these can include emissions from leased assets and outsourced services that were not included in scope 1 or scope 2.

The inclusion of scope 3 emissions allows public agencies to expand their inventory boundary along their value chain, providing a broad overview of linkages (such as inter-agency management of shared resources) which offer opportunities for significant GHG emission reductions (see Chapter 4 for an overview of activities that can generate GHG emissions along an organization’s value chain).

Select a Calculation Approach

The IPCC guidelines (IPCC, 2006) refer to a hierarchy of calculation approaches and techniques, ranging from the application of generic emission factors to direct monitoring. The most accurate GHG emission data can be obtained through direct measurement by monitoring concentration and flow rate, but this approach is not commonly available or practical for most organizations. Emissions can also be calculated on a mass balance or stoichiometric basis specific to a facility or process. However, the most common approach for calculating GHG emissions is through the application of documented emission factors. These factors are calculated ratios relating GHG emissions to a measure of activity (for example, electricity emission factors are expressed in tons of CO2 equivalent per kilowatt-hour).

In many cases, accurate emission data can be calculated from fuel use data. Even small users usually know the amount of fuel consumed and have access to data on the carbon content of the fuel through default carbon content coefficients or through more accurate periodic fuel sampling. Public organizations should use the most accurate calculation approach available to them and appropriate for their reporting context, and should consult the tools available through voluntary reporting programs like The Climate Registry or ICLEI.

United Technologies Corporation (UTC): More than meets the eye

In 1996, UTC, a global aerospace and building systems technology corporation, appointed a team to set boundaries for the company's new Natural Resource Conservation, Energy and Water Use Reporting Program. The team focused on the sources of energy that should be included in the program's annual report of energy consumption. The team decided jet fuel needed to be reported in the annual report, as jet fuel was used by a number of UTC divisions for engine and flight hardware testing and for test firing. Although the amount of jet fuel used in any given year was subject to wide variation due to changing test schedules, the total amount consumed in an average year was believed to be small and potentially small enough to be specifically excluded. However, jet fuel consumption reports proved that initial belief incorrect. Jet fuel has accounted for between 9 and 13 percent of the corporation's total annual use of energy since the program commenced. Had UTC not included the use of jet fuel in annual data collection efforts, a significant emissions source would have been overlooked.

Collect Activity Data and Choose Emission Factors

For most small- to medium-sized public organizations and for many larger public organizations, scope 1 GHG emissions are calculated on the basis of the purchased (or consumed) quantities of commercial fuels (such as natural gas, vehicle fuels, and heating oil) using published emission factors. Much of the information required to complete the inventory may already be available in other data bases maintained by the agency.[1] Coordinating with the parties responsible for such data may simplify reporting and avoid unnecessary duplication of effort. However, some organizations may have difficulty gathering sufficiently disaggregated data to allow for inventory calculations at the appropriate level; in these cases, organizations must clearly identify limitations on data in the inventory report.

Some public organizations (e.g., DoD and NASA) have unique industrial operations and operate their own power generation facilities. Organizations have to ensure that they develop appropriate emissions factors from these unique emission sources. Scope 2 GHG emissions are primarily calculated from metered electricity consumption and supplier-specific, local grid, or other published emission factors. Scope 3 GHG emissions are primarily calculated from activity data such as fuel use or passenger miles and published or third-party emission factors. In most cases, if source- or facility-specific emission factors are available, they are preferable to more generic or general emission factors.

Public organizations that undertake industrial-type work may be faced with a wider range of approaches and methods. They should seek guidance from the

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[1] U.S. federal agencies are required to measure and report annually their facility and vehicle fleet energy use to the Federal Energy Management Program to satisfy Energy Policy Act 2005 and EO 13423 requirements.

sector-specific guidelines on the GHG Protocol website (if available) or from agency protocols and studies.

Apply Calculation Tools

Comment [W2]: Would like to include list of calculation and inventory management tools currently available to public agencies (including tools from EPA, ICLEI, The Climate Registry, and other programs).

This section provides an overview of the GHG calculation tools and guidance available on the GHG Protocol Initiative website (www.ghgprotocol.org). Use of these tools is encouraged as they have been peer reviewed by experts and industry leaders, are regularly updated, and are believed to be the best available. The tools, however, are optional. Public organizations may substitute their own GHG calculation methods, provided they are more accurate than or are at least consistent with the approaches in the *Public Sector Protocol*.

There are two main categories of calculation tools:

- Cross-sector tools that can be applied to different sectors. These include stationary combustion, mobile combustion, HFC and PFC use in refrigeration and air conditioning, and measurement and estimation uncertainty.
- Sector-specific tools that are designed to calculate emissions in specific sectors such as aluminum, iron and steel, cement, oil and gas, pulp and paper, and office-based organizations.

Many public organizations may need to use more than one calculation tool to cover all their GHG emission sources. Table 6-2 lists the tools available.

Table 0-2. Overview of GHG Calculation Tools Available on GHG Protocol Website

Calculation tools	Main features
Cross-sector tools	
Stationary combustion	Calculates direct and indirect CO_2 emissions from fuel combustion in stationary equipment. Provides two options for allocating GHG emissions from a cogeneration facility. Provides default fuel and national average electricity emission factors.
Mobile combustion	Calculates direct and indirect CO_2 emissions from fuel combustion in mobile sources. Provides calculations and emission factors for road, air, water, and rail transport.
HFC from air conditioning and refrigeration use	Calculates direct HFC emissions during manufacture, use, and disposal of refrigeration and A/C equipment in commercial applications. Provides three calculation methods based on sales, life-cycle stage, and emission factors.

Table 0-2. Overview of GHG Calculation Tools Available on GHG Protocol Website

Calculation tools	Main features
Measurement and estimation uncertainty for GHG emissions	Introduces the fundamentals of uncertainty analysis and quantification. Calculates statistical parameter uncertainties due to random errors related to calculation of GHG emissions. Automates the aggregation steps involved in developing a basic uncertainty assessment for GHG inventory data.
Sector-specific tools	
Aluminum and other nonferrous metals production	Calculates direct GHG emissions from aluminum production (CO_2 from anode oxidation, PFC emissions from the "anode effect," and SF_6 used in nonferrous metals production as a cover gas).
Iron and steel	Calculates direct GHG emissions (CO_2) from oxidation of the reducing agent, calcination of the flux used in steel production, and removal of carbon from the iron ore and scrap steel used.
Nitric acid manufacture	Calculates direct GHG emissions (N_2O) from the production of nitric acid.
Ammonia manufacture	Calculates direct GHG emissions (CO_2) from ammonia production. This is for the removal of carbon from the feedstock stream only; combustion emissions are calculated with the stationary combustion module.
Adipic acid manufacture	Calculates direct GHG emissions (N_2O) from adipic acid production.
Cement	Calculates direct CO_2 emissions from the calcination process in cement manufacturing (WBCSD tool also calculates combustion emissions). Provides two calculation methods: one cement based and the other clinker based.
Lime	Calculates direct GHG emissions from lime manufacturing (CO_2 from the calcination process).
HFC-23 from hydrochlorofluorocarbons (HCFC)-22 production	Calculates direct HFC-23 emissions from production of HCFC-22.
Pulp and paper	Calculates direct CO_2, CH_4, and N_2O emissions from production of pulp and paper. This includes calculation of direct and indirect CO_2 emissions from combustion of fossil fuels, biofuels, and waste products in stationary equipment.
Guide for small office-based organizations	Calculates direct CO_2 emissions from fuel use, indirect CO_2 emissions from electricity consumption, and other indirect CO_2 emissions from public organization travel and commuting.

STRUCTURE OF GHG PROTOCOL CALCULATION TOOLS.

Each of the cross-sector and sector-specific calculation tools on the website share a common format and include step-by-step guidance on measuring and calculating emissions data. Each tool consists of a guidance section and automated worksheets with explanations on how to use them.

The guidance for each calculation tool includes the following sections:

- Overview: provides an overview of the purpose and content of the tool, the calculation method used, and a process description.
- Choosing activity data and emission factors: provides sector-specific good practice guidance and references for default emission factors.
- Calculation methods: describes different calculation methods depending on the availability of site-specific activity data and emission factors.
- Quality control: provides good practice guidance.
- Internal reporting and documentation: provides guidance on internal documentation to support emissions calculations.

In the automated worksheet section, it is only necessary to insert activity data into the worksheets and to select an appropriate emission factor or factors. Default emission factors are provided for the sectors covered, but inserting customized emission factors more representative of the reporting organization's operations or more up to date is also possible.[2] The emissions of each GHG (CO_2, CH_4, N_2O, etc.) are calculated separately and then converted to CO_2 equivalents on the basis of their global warming potential.

Some tools, such as the Refrigeration and Air-Conditioning cross-sector tool, take a tiered approach, offering a choice between a simple and a more advanced calculation method. The more advanced methods are expected to produce more accurate emissions estimates but usually require collection of more detailed data and a more thorough understanding of an organization's technologies.

[2] Emissions factors from various sources, such as the IPCC may be updated independently from the *Public Sector Protocol*. Organizations should consider updating calculation tools as necessary based on reporting requirements.

Climate Leadership In Parks (CLIP): Greenhouse Gas Emissions Inventory Tool

The Climate Friendly Parks (CFP) program stems from a partnership between the U.S. EPA and NPS and works to educate, communicate, and mitigate climate change by:

- Educating every park employee about climate change and what role each can take in addressing the problem.
- Identifying a strategy for each CFP to reduce their GHG emissions in order to help mitigate the effects of climate change.
- Empowering every park employee to communicate to the public how climate change is affecting their park's natural resources, how the park is dealing with these effects, and the difference each person can make in being stewards of our climate and other natural resources.

The CFP program created the CLIP Tool in order to help National Parks conduct emission inventories, develop action plans, and communicate about climate change. The emissions inventory has been designed to assist park employees to approximate emissions that occur within park boundaries. This is done by looking at both GHGs and criteria air pollutants (CAPs). It will also pinpoint how employees, concessionaires, and visitors each impact climate change.

The emissions inventory module estimates emissions of GHGs and CAPs. While both types of emissions often result from similar activities, there are some differences in how these emissions are estimated.

The Emissions Inventory Tool is broken into four key sections: control, background, GHG sources, and CAP sources. The control section is the main interface of the inventory tool, where users insert all key information about a park. The background component provides users with directions and assistance on how to make use of the tool. It specifically focuses on what data needs to be collected and how to go about obtaining that information. The next two sections focus on calculations. They are broken into GHG calculations and CAP calculations. Both calculators are separated into the individual emission sources that are relevant to each park. At the end the user is presented with a summary sheet.

Source: http://www.nps.gov/climatefriendlyparks/CLIPtool/emissioninventory.htm.

Roll Up GHG Emissions Data to Organizational or Headquarters Level

To report an organization's total GHG emissions, public organizations will usually need to gather and summarize data from multiple facilities, across different subordinate agencies or divisions, and possibly in different countries. Planning this process carefully minimizes the reporting burden, reduces the risk of errors that might occur while compiling data, and ensures that all facilities are collecting information on an approved, consistent basis. Ideally, organizations integrate GHG reporting with their existing reporting tools and processes, and take advantage of any relevant data already collected and reported by facilities to division or headquarters offices, regulators, or other stakeholders.

The tools and processes chosen to report data depend upon the information and communication infrastructure already in place (i.e., how easy it is to include new data categories in headquarters databases). It also depends on the amount of detail headquarters wishes to be reported from facilities. Data collection and management tools could include the following:

- Secure databases available over the organizations intranet or internet, for direct data entry by facilities
- Spreadsheet templates filled out and e-mailed to a headquarters or division office, where data are processed further
- Paper reporting forms faxed to a headquarters or division office where data is reentered in a headquarters database. However, this method may increase the likelihood of errors if sufficient checks are not in place to ensure the accurate transfer of the data.

BP: A standardized system for internal reporting of GHGs

BP, a global energy company, has been collecting GHG data from the different parts of its operations since 1997 and has consolidated its internal reporting processes into one central database system. The responsibility for reporting environmental emissions lies with about 320 individual BP facilities and business departments, which are termed "reporting units." All reporting units have to complete a standard Excel pro forma spreadsheet every quarter, stating actual emissions for the preceding 3 months and updates to forecasts for the current year and the next 2 years. In addition, reporting units are asked to account for all significant variances, including sustainable reductions. The reporting units all use the same BP GHG Reporting Guidelines "Protocol" (BP, 2000) for quantifying their emissions of CO_2 and CH_4.

All pro forma spreadsheets are e-mailed automatically by the central database to the reporting units, and the completed e-mail returns are uploaded into the database by a corporate team, which checks the quality of the incoming data. The data are then compiled, by the end of the month following each quarter end, to provide the total emission inventory and forecasts for analysis against BP's GHG target. Finally, the inventory is reviewed by a team of independent external auditors to ensure the quality and accuracy of the data.

For internal reporting up to the headquarters level, the use of standardized reporting formats is recommended to ensure that data received from different public organization units and facilities are comparable and that internal reporting rules are observed (see BP case study). Standardized formats can significantly reduce the risk of errors.

Approaches for rolling up GHG Emissions data to headquarters level

There are two basic approaches for gathering data on GHG emissions from a public organization's subordinate facilities (Table 6-3):

- *Centralized*. Individual facilities report activity and fuel use data (such as quantity of fuel used) to the headquarters level, where GHG emissions are calculated.

- *Decentralized*. Individual facilities collect activity and fuel use data, directly calculate their GHG emissions using approved methods, and report this data to the headquarters level.

Table 0-3. Approaches to Gathering GHG Data

Approach	Site Level	Headquarters level
Centralized	Activity data	Site report activity data (GHG emissions calculated at headquarters level: activity data × emissions factor = GHG emissions)
Decentralized	Activity data × emission factor = GHG emissions	Sites report GHG emissions

The difference between these two approaches is in where the emissions calculations occur (i.e., where activity data are multiplied by the appropriate emission factors) and in what type of quality management procedures must be put in place at each level of the organization. Facility-level staff members are generally responsible for initial data collection under both approaches. When deciding on an approach, public organizations also need to consider how other related data are collected across the organization such as energy use, fuel use, air emissions, and toxic release inventories.

Centralized Approach: Individual Facilities Report Activity and Fuel Use Data

This approach may be particularly suitable for office-based organizations. Requesting that facilities report their activity and fuel use data may be the preferred option if

- The staff at the headquarters or division level can calculate emissions data in a straightforward manner on the basis of activity or fuel use data, and

- Emissions calculations are standard across a number of facilities.

Decentralized Approach: Individual Facilities Calculate GHG Emissions Data

Asking facilities to calculate GHG emissions themselves helps to increase their awareness and understanding of the issue. However, it may also lead to resistance, increased training needs, an increase in calculation errors, and a greater need for auditing of calculations. Requesting that facilities calculate GHG emissions themselves may be the preferred option if:

- GHG emission calculations require detailed knowledge of the kind of equipment being used at facilities,
- GHG emission calculation methods vary across a number of facilities,
- Process emissions (in contrast to emissions from burning fossil fuels) make up an important share of total GHG emissions,
- Resources are available to train the facility staff to conduct these calculations and to audit them,
- A user-friendly tool is available to simplify the calculation and reporting task for the facility-level staff, or
- Local regulations require reporting of GHG emissions at a facility level.

The choice of collection approach depends on the needs and characteristics of the reporting organization. To maximize accuracy and minimize reporting burdens, some public organizations use a combination of the two approaches. Complex facilities with process emissions calculate their emissions at the facility level, while facilities with uniform emissions from standard sources only report fuel use, electricity consumption, and travel activity. The headquarters database or reporting tool then calculates total GHG emissions for each of these standard activities.

The two approaches are not mutually exclusive and should produce the same result. Thus, public organizations desiring a consistency check on facility-level calculations can follow both approaches and compare the results. Even when facilities calculate their own GHG emissions, the headquarters staff may still wish to gather activity and fuel use data to double-check calculations and explore opportunities for emissions reductions. These data should be available and transparent to staff at all headquarters levels. The headquarters staff should also verify that facility-reported data are based on well defined, consistent, and approved inventory boundaries, reporting periods, calculation methodologies, etc.

Common Guidance on Reporting to Headquarters Level

Reports from facility level to headquarters or division offices should include all relevant information as specified in Chapter 9. Some reporting categories are common to both the centralized and decentralized approaches and should be reported by facilities to their headquarters offices, including the following:

- A brief description of the emission sources
- A list and justification of specific exclusion or inclusion of sources
- Comparative information from previous years
- The reporting period covered
- Any trends evident in the data
- Progress toward any public organization targets
- A discussion of uncertainties in activity/fuel use or emissions data reported, their likely cause, and recommendations for how data can be improved
- A description of events and changes that have an impact on reported data (acquisitions, restructuring, closures, technology upgrades, changes of reporting boundaries or calculation methods applied, etc.).

Reporting for the Centralized Approach

In addition to the activity/fuel use data and aforementioned common categories of reporting data, facilities following the centralized approach by reporting activity/fuel use data to the headquarters level should also report the following:

- Activity data for freight and passenger transport activities (e.g., freight transport in ton-miles)
- Activity data for process emissions (e.g., tons of waste in landfills)
- Clear records of any calculations undertaken to derive activity/fuel use data
- Local emission factors necessary to translate fuel use and/or electricity consumption into CO_2 emissions.

Reporting for the Decentralized Approach

In addition to the GHG emissions data and aforementioned common categories of reporting data, individual facilities following the decentralized approach by reporting calculated GHG emissions to the headquarters level should also report the following:

- A description of GHG calculation methods and any changes made to those methods relative to previous reporting periods

- Ratio indicators (see Chapters 9 and 11)
- Details on any data references used for the calculations, in particular information on emission factors used.

Clear records of calculations undertaken to derive emissions data should be kept for any future internal or external verification.

Chapter 7
Managing Inventory Quality

GUIDANCE

An organization's GHG reporting objectives should guide the design of an inventory quality management system, as well as the treatment of uncertainty within its inventory.

In addition to the *Public Sector Protocol*, public organizations can use the EPA *Program Guide for Climate Leaders* (*Program Guide*) to develop a practical framework, or inventory management plan (IMP), for the quality management of a GHG accounting system.[1] An IMP describes the steps a public organization is taking in developing a GHG inventory, including GHG accounting procedures, and data collection and reporting. An IMP should also describe the implementation of steps to manage the quality of the inventory. An IMP provides a systematic process for preventing and correcting errors, and identifies areas where investments will likely lead to the greatest improvement in overall inventory quality. However, the primary objective of an IMP is ensuring the credibility of an organization's GHG inventory information.[2]

Defining inventory quality

Chapter 1 outlines five accounting principles that set an implicit standard for the faithful representation of an organization's GHG emissions through its technical, accounting, and reporting efforts. Putting these principles into practice will result in a credible and unbiased treatment and presentation of issues and data. The goal of an IMP is to ensure that these principles are put into practice.

This chapter addresses the steps a public organization can take to implement an IMP, practical inventory quality measures for implementation, and inventory quality and inventory uncertainty (i.e., types and limitations of uncertainty estimates).

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[1] The *Corporate Standard* calls this framework an *Inventory Quality Management System*, and the *Program Guide* calls it an *Inventory Management Plan* (IMP). We use the latter term in this Chapter of the *Public Sector Protocol*. See EPA, *Program Guide for Climate Leaders*, March 2007, http://www.epa.gov/.

[2] Although the term "emissions inventory" is used throughout this chapter, the guidance applies equally to estimates of removals due to sink categories (e.g., forest carbon sequestration).

The *Corporate Standard* recognizes that public organizations have limited resources and, unlike financial accounting, organizational GHG inventories involve a level of scientific and engineering complexity. Therefore, public organizations should develop their IMP as a cumulative effort in keeping with their resources, the broader evolution of policy, and their own organizational vision.

An inventory program framework

A practical framework is needed to help public organizations conceptualize and design a quality management system and plan, or IMP, for future improvements. The IMP focuses on the following institutional, managerial, and technical components of an inventory (Table 7-1):

- *Methods*. These are the technical aspects of inventory preparation. Public organizations should select or develop methods for estimating emissions that accurately represent the characteristics of their source categories. The GHG Protocol provides many default methods and calculation tools to help with this effort. The design of an inventory program and quality management system should provide for the selection, application, and updating of inventory methods as new research becomes available, changes are made to organizational operations, or the importance of inventory reporting is elevated.

- *Data*. Data are the basic information on activity levels, emission factors, processes, and operations. Although methods need to be appropriately rigorous and detailed, data quality is more important. No method can compensate for poor quality input data. The design of an organization's inventory program should facilitate the collection of high-quality inventory data and the maintenance and improvement of collection procedures.

- *Inventory Processes and Systems*. These are the institutional, managerial, and technical procedures for preparing GHG inventories. They include the team and processes charged with the goal of producing a high-quality inventory. To streamline GHG inventory quality management, these processes and systems should be integrated, where appropriate, with other organizational processes related to quality.

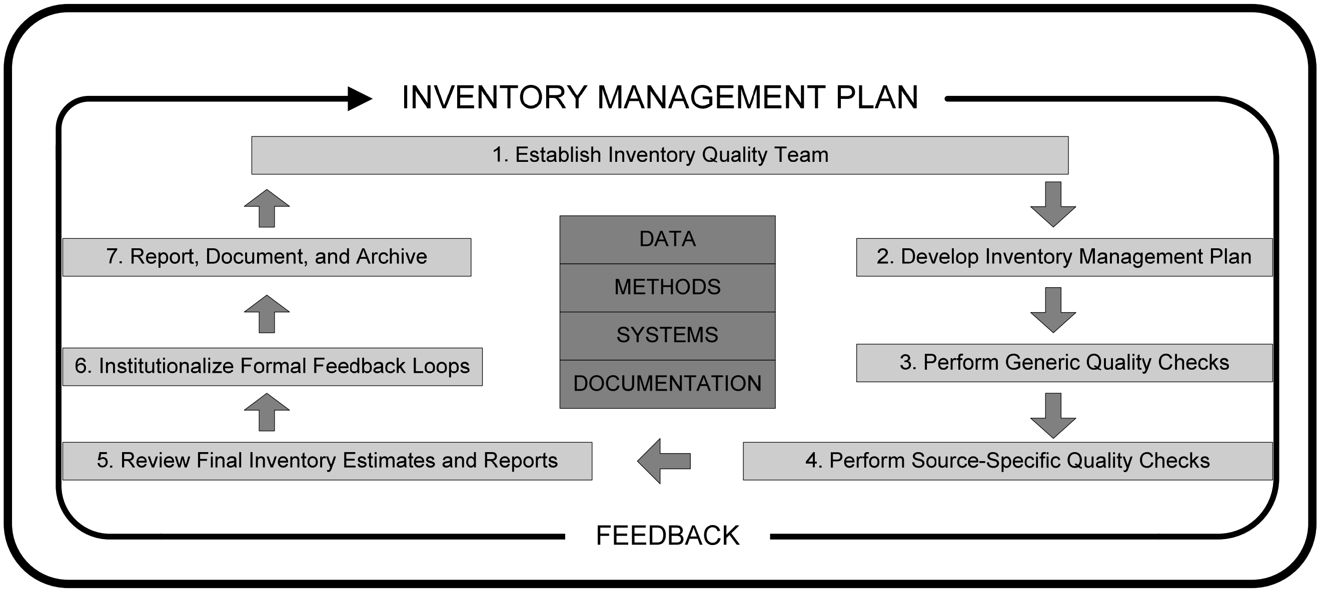
- *Documentation*. This is the record of methods, data, processes, systems, assumptions, and estimates used to prepare an inventory. It includes everything employees need to prepare and improve an organization's inventory. Because estimating GHG emissions is inherently technical (involving engineering and science), high-quality, transparent documentation is particularly important for credibility. If information is not credible, or fails to be effectively communicated to internal or external stakeholders, it will not have value.

Table 0-1. IMP Fundamentals

Inventory component	Details
Methods—the technical aspects of inventory preparation	Define inventory boundaries and treatment of joint ventures and identify sources, etc. (see Chapters 3, 4, and 6). Identify methods for estimating emissions; the GHG Protocol website (http://www.ghgprotocol.org/) provides many default methods and protocols to help organizations with this effort. Establish procedures for applying and updating inventory methods in response to new organization activities, new technical information, or new reporting requirements.
Data—the basic information on activity levels, emission factors, processes, and operations	Develop the approach and assign roles and responsibilities to facilitate collection of high-quality inventory data. Create a process for the maintenance and improvement of data collection procedures.
Inventory processes and systems—the institutional, managerial, and technical procedures for preparing GHG inventories	Define all institutional, managerial, and formal procedural aspects required to develop and maintain a GHG inventory that meets the *Public Sector Protocol* accounting and reporting standards. Whenever reasonable, integrate these processes with other organization processes.
Documentation—the record of methods, data, processes, systems, assumptions, and estimates used to prepare an inventory	Identify internal and external audiences and develop procedures to document information intended for their use. Establish documentation sufficient for an inventory development team to accurately and efficiently continue preparing and improving all four fundamentals in the organization's inventory. Ensure that documentation provides sufficient transparency to facilitate potential internal or external verification.

Source: EPA, *Program Guide for Climate Leaders*, March 2007, http://www.epa.gov/.

Figure 0-1. Inventory Management Plan



Implementing an IMP

An organization's IMP should address all four of the inventory components described above. To implement the IMP, an organization should take the following seven steps (see Figure 7-1):

1. *Establish an inventory team*. This team is responsible for implementing a quality management system and continually improving inventory quality. The team or manager should coordinate interactions between relevant operational units, facilities, and external entities such as government programs, research institutions, verifiers, or consulting firms.

2. *Develop an IMP*. This plan describes the steps an organization is taking to develop a GHG inventory, which should be incorporated into the design of its inventory program from the beginning, although further rigor and coverage of certain procedures may be phased in over multiple years. The IMP should include procedures for all organizational levels and inventory development processes—from initial data collection to final reporting of accounts. For efficiency and comprehensiveness, public organizations should integrate (and extend as appropriate) existing quality systems to cover GHG management and reporting, such as any ISO 9000 (Quality Management) and ISO 14001 (Environmental Management) procedures. To ensure accuracy, the bulk of the plan should focus on practical measures for ensuring quality, as described in steps 3 and 4.

3. *Perform generic quality checks*. These apply to data and processes across the entire inventory, focusing on appropriately rigorous quality checks on data handling, documentation, and emission calculation activities (e.g., ensuring that the correct unit conversions are used). Guidance on quality checking procedures is provided in the section on implementation below (see Table 7-2).

Table 0-2. Generic Quality Management Measures

Data gathering, input, and handling activities
Check a sample of input data for transcription errors.
Validate input data prior to calculating GHG emissions to check for outliers (e.g., impossibly high fuel economy rates for vehicles)
Identify spreadsheet modifications that could provide additional controls for data protection or checks on quality.
Ensure that adequate version control procedures for electronic files have been implemented.
Data documentation
Confirm that bibliographical data references are included in spreadsheets for all primary data.
Check that copies of cited references have been archived.
Check that assumptions and criteria for selection of boundaries, base years, methods, activity data, emission factors, and other parameters are documented.
Check that changes in data or methods are documented.
Calculating emissions and checking calculations
Check whether emission units, parameters, and conversion factors are appropriately labeled.
Check whether units are properly labeled and correctly carried through from the beginning to the end of calculations.
Check that conversion factors are correct.
Check the data processing steps (e.g., equations) in the spreadsheets.
Check that spreadsheet input data and calculated data are clearly differentiated.
Check a representative sample of calculations, by hand or electronically.
Check some calculations with abbreviated calculations (i.e., back-of-the-envelope calculations).
Check the aggregation of data across source categories, operational units, etc.
Check consistency of time series inputs and calculations.
Get staff not involved in inventory development to spot check data handling and calculations

4. *Perform source-category-specific quality checks*. This includes more rigorous investigations into the appropriate application of boundaries, recalculation procedures, and adherence to accounting and reporting principles for specific source categories, as well as the quality of the data input used (e.g., whether electricity bills or meter readings are the best source of consumption data) and a qualitative description of the major causes of uncertainty in the data. The information from these investigations can also be used to support a quantitative assessment of uncertainty. Guidance on these investigations is provided in the section below on implementation.

5. *Review final inventory estimates and reports*. After the inventory is completed, an internal technical review should focus on its engineering, scientific, and other technical aspects. Subsequently, an internal managerial review should focus on securing official organizational approval of and support for the inventory. Chapter 10 addresses a third type of review involving experts external to the organization's inventory program.

6. *Institutionalize formal feedback loops*. The results of the reviews in step 5, as well as the results of every other component of an organization's quality management system, should be fed back via formal feedback procedures to the person or team identified in step 1. Errors should be corrected and improvements implemented based on this feedback.

7. *Establish reporting, documentation, and archiving procedures*. The system should contain record-keeping procedures that specify the information to be documented for internal purposes, how that information should be archived, and the information to be reported to external stakeholders. Like internal and external reviews, these record-keeping procedures include formal feedback mechanisms.

An organization's IMP and overall inventory program should be treated as evolving, in keeping with an organization's reasons for preparing an inventory. The plan should address the organization's strategy for a multiyear implementation (i.e., recognize that inventories are a long-term effort), including steps to ensure that all quality control findings from previous years are adequately addressed.

Practical Measures for Implementation

Although principles and broad program design guidelines are important, any guidance on inventory management would be incomplete without a discussion of practical inventory management measures. An organization should implement these measures at multiple levels, from the point of primary data collection to the final headquarters inventory approval process. Implementing these measures at points in the inventory program where errors are most likely to occur—such as the initial data collection phase and during calculation and data aggregation—is important. Although headquarters-level inventory quality may initially be emphasized, ensuring quality measures are implemented at all levels of disaggregation (e.g., facility, process, geographical, according to a particular scope, etc.) better prepares the organization for GHG markets or regulation in the future.

Public organizations also need to ensure the quality of their historical emission estimates and trend data. They can do so by employing inventory quality measures to minimize biases that can arise from changes in the characteristics of the data or methods used to calculate historical emission estimates and by following the standards and guidance of Chapter 5.

The third step of a quality management system, as described above, is to implement generic quality checking measures. These measures apply to all source categories and all levels of inventory preparation. Table 7-2 lists such measures.

The fourth step of an IMP is source-category-specific data quality investigations. The information gathered from these investigations can also be used for the quantitative and qualitative assessment of data uncertainty (see the section on uncertainty). Addressed below are the types of source-specific quality measures that can be employed for emission factors, activity data, and emission estimates.

EMISSION FACTORS AND OTHER PARAMETERS

For a particular source category, emissions calculations generally rely on emission factors and other parameters (e.g., utilization factors, oxidation rates, and methane conversion factors).[3] These factors and parameters may be published or default factors based on organization-specific data, site-specific data, or direct emission or other measurements. For fuel consumption, published emission factors based on fuel energy content are generally more accurate than those based on mass or volume, except when mass- or volume-based factors have been measured at the organization- or site-specific level. Quality investigations need to assess the representativeness and applicability of emission factors and other parameters to the specific characteristics of an organization. Differences between measured and default values need to be qualitatively explained and justified on the basis of the organization's operational characteristics.

ACTIVITY DATA

The collection of high-quality activity data is often the most significant limitation for organization GHG inventories. Therefore, establishing robust data collection procedures takes priority in the design of any organization's inventory program. The following are useful measures for ensuring the quality of activity data:

- Develop data collection procedures that allow the same data to be efficiently collected in future years.
- Convert fuel consumption data to energy units before applying carbon content emission factors, which may better correlate to a fuel's energy content than its mass.

[3] Some emission estimates may be derived using mass or energy balances, engineering calculations, or computer simulation models. In addition to investigating the input data to these models, organizations should consider whether the internal assumptions (including assumed parameters in the model) are appropriate to the nature of their operations.

- Compare current year data with historical trends. If data do not exhibit relatively consistent changes from year to year, the causes for these patterns should be investigated (e.g., changes of more than 10 percent from year to year may warrant further investigation).

- Compare activity data from multiple reference sources (e.g., government survey data or data compiled by trade associations) with organization data when possible. Such checks can ensure that consistent data are being reported to all parties. Data can also be compared among facilities within an organization.

Interface: Integration of emissions and business data systems

Interface, Inc., is the world's largest manufacturer of carpet tiles and upholstery fabrics for commercial interiors. The company has established an environmental data system that mirrors its corporate financial data reporting. The Interface EcoMetrics system is designed to provide activity and material flow data from business units in a number of countries (the United States, Canada, Australia, the United Kingdom, Thailand, and throughout Europe) and provides metrics for measuring progress on environmental issues such as GHG emissions. Using company-wide accounting guidelines and standards, energy and material input data are reported to a central database each quarter and made available to sustainability personnel. These data are the foundation of Interface's annual inventory and enable data comparison over time in the pursuit of improved quality.

Basing emissions data systems on financial reporting helps Interface improve its data quality. Just as financial data need to be documented and defensible, Interface's emissions data are held to standards that promote an increasingly transparent, accurate, and high-quality inventory. Integrating its financial and emissions data systems has made Interface's GHG accounting and reporting more useful as it strives to be a "completely sustainable company" by 2020.

- Investigate activity data that are generated for purposes other than preparing a GHG inventory. In doing so, public organizations need to check the applicability of these data to inventory purposes, including completeness, consistency with the source category definition, and consistency with the emission factors used. For example, data from different facilities may be examined for inconsistent measurement techniques, operating conditions, or technologies. Quality control measures (e.g., ISO) may have already been conducted during the data's original preparation. These measures can be integrated with the organization's IMP.

- When sufficient activity data are not available to allow for reliable calculations, ensure that this lack of information is transparently conveyed in the inventory report. Note the shortcoming, attempt to estimate the missing data based on comparable activities, and work to implement corrective measures for subsequent inventories.

- Check that base year recalculation procedures have been followed consistently and correctly (see Chapter 5).

- Check that operational and organizational boundary decisions have been applied correctly and consistently to the collection of activity data (see Chapters 3 and 4).

- Investigate whether biases or other characteristics that could affect data quality have been previously identified (e.g., by communicating with experts at a particular facility or elsewhere). For example, a bias could be the unintentional exclusion of operations at smaller facilities or data that do not correspond exactly with organizational boundaries.

- Extend quality management measures to cover any additional data (sales, production, etc.) used to estimate emission intensities or other ratios.

- Use and compare to data used for reporting for other purposes, such as the U.S. federal agency energy or fuel use reporting to DOE under the Energy Independence and Security Act, or reporting to EPA under Title IV of the Clean Air Act. Title IV of the Clean Air Act requires owners or operators of regulated facilities to measure and report sulfur dioxide, NO_x, and CO_2 emissions under the EPA's Acid Rain Program. Data on CO_2 emissions reported can be used directly in an organization's GHG inventory.

EMISSION ESTIMATES

Estimated emissions for a source category can be compared with historical data or other estimates to ensure they fall within a reasonable range. Potentially unreasonable estimates are cause for checking emission factors or activity data and determining whether changes in method, market forces, or other events are sufficient reasons for the change. In situations where actual emission monitoring occurs (e.g., power plant CO_2 emissions), the data from monitors can be compared with calculated emissions using activity data and emission factors.

If any of the above emission factor, activity data, emission estimate, or other parameter checks indicate a problem, more detailed investigations into the accuracy of the data or appropriateness of the methods may be required. These more detailed investigations can also be utilized to better assess the quality of data. One potential measure of data quality is a quantitative and qualitative assessment of their uncertainty.

USDA Forest Service: The importance of accuracy checks

The experience of the USDA Forest Service illustrates the importance of attention to detail in setting up GHG information collection systems. The company wished to calculate the GHG emissions from its leased vehicles, and the leasing agency provided data on fuel consumption and vehicle miles traveled. However, when performing a quality control check on these data, the Forest Service determined that these data implied impossibly high vehicle fuel economies. Had the Forest Service not performed these checks, it would have based its GHG mitigation strategies on incorrect data.

Inventory Quality and Inventory Uncertainty

Preparing a GHG inventory is inherently both an accounting and a scientific exercise. Most applications for organization-level emissions and removal estimates require that these data be reported in a format similar to financial accounting data. In financial accounting, it is standard practice to report individual point estimates (i.e., single values rather than a range of possible values). In contrast, the standard practice for most scientific studies of GHG and other emissions is to report quantitative data with estimated error bounds (i.e., uncertainty). Just like financial figures in a profit and loss or bank account statement, point estimates in an organization emission inventory have obvious uses. However, how would or should the addition of some quantitative measure of uncertainty to an emission inventory be used?

In an ideal situation, in which an organization had perfect quantitative information on the uncertainty of its emission estimates at all levels, the primary use of this information would almost certainly be comparative. Such comparisons might be made across public organizations, operational units, or source categories or through time. In this situation, inventory estimates could even be rated or discounted on the basis of their quality before they were used, with uncertainty being the objective quantitative metric for quality. Unfortunately, such objective uncertainty estimates rarely exist.

Types of Uncertainties

Uncertainties associated with GHG inventories can be broadly categorized into scientific uncertainty and estimation uncertainty. Scientific uncertainty arises when the science of the actual emission or removal process is not completely understood. For example, many direct and indirect factors associated with GWP values that are used to combine emission estimates for various GHGs involve significant scientific uncertainty. Analyzing and quantifying such scientific uncertainty is extremely problematic and is likely to be beyond the capacity of most organization inventory programs.

Estimation uncertainty arises any time GHG emissions are quantified. Therefore, all emissions or removal estimates are associated with estimation uncertainty. Estimation uncertainty can be further classified into two types: model uncertainty and parameter uncertainty.[4]

Model uncertainty refers to the uncertainty associated with the mathematical equations (i.e., models) used to characterize the relationships between various parameters and emission processes. For example, model uncertainty may arise either due to the use of an incorrect mathematical model or inappropriate input into the model. As with scientific uncertainty, estimating model uncertainty is likely to be beyond most organization's inventory efforts; however, some public organizations may wish to utilize their unique scientific and engineering expertise to evaluate the uncertainty in their emission estimation models.

Parameter uncertainty refers to the uncertainty associated with quantifying the parameters used as inputs (e.g., activity data and emission factors) into estimation models. Parameter uncertainties can be evaluated through statistical analysis, measurement equipment precision determinations, and expert judgment. Quantifying parameter uncertainties and then estimating source category uncertainties on the basis of these parameter uncertainties will be the primary focus of public organizations that choose to investigate the uncertainty in their emission inventories.

LIMITATIONS OF UNCERTAINTY ESTIMATES

Given that only parameter uncertainties are within the feasible scope of most public organizations, uncertainty estimates for organization GHG inventories are, of necessity, imperfect. Complete and robust sample data are not always available to assess the statistical uncertainty in every parameter.[5] For most parameters (e.g., gallons of gasoline purchased or tons of limestone consumed), only a single data point may be available. In some cases, public organizations can utilize instrument precision or calibration information to inform their assessment of statistical uncertainty. However, to quantify some of the systematic uncertainties associated with parameters and to supplement statistical uncertainty estimates,[6] public organizations usually have to rely on

[4] Emissions estimated from direct emissions monitoring generally only involve parameter uncertainty (e.g., equipment measurement error).

[5] Statistical uncertainty results from natural variations (e.g., random human errors in the measurement process and fluctuations in measurement equipment). Statistical uncertainty can be detected through repeated experiments or sampling of data.

[6] Systematic parameter uncertainty occurs if data are systematically biased. In other words, the average of the measured or estimated value is always less or greater than the true value. Biases arise, for example, because emission factors are constructed from non-representative samples, all relevant source activities or categories have not been identified, or incorrect or incomplete estimation methods or faulty measurement equipment have been used. Because the true value is unknown, such systematic biases cannot be detected through repeated experiments and, therefore, cannot be quantified through statistical analysis. However, identifying biases (and, sometimes, quantifying them) through data quality investigations and expert judgments is possible.

expert judgment.[7] The problem with expert judgment, though, is that it is difficult to obtain in a comparable (i.e., unbiased) and consistent manner across parameters, source categories, or different public organizations.

For these reasons, almost all comprehensive estimates of uncertainty for GHG inventories are not only imperfect but also have a subjective component and, despite the most thorough efforts, are themselves considered highly uncertain. In most cases, uncertainty estimates cannot be interpreted as an objective measure of quality, nor can they be used to compare the quality of emission estimates between source categories or public organizations.

The following cases—which assume that either statistical or instrument precision data are available to objectively estimate each parameter's statistical uncertainty (i.e., expert judgment is not needed)—are exceptions:

- When two operationally similar facilities use identical emission estimation methods, the differences in scientific or model uncertainties can, for the most part, be ignored. Quantified estimates of statistical uncertainty can be treated as being comparable between facilities. Some trading programs that prescribe specific monitoring, estimation, and measurement requirements aim for this type of comparability. However, even in this situation, the degree of comparability depends on the flexibility that participants are given for estimating emissions, homogeneity across facilities, and level of enforcement and review of the methods used.

- Similarly, when a single facility uses the same estimation method each year, the systematic parameter uncertainties—in addition to scientific and model uncertainties—in a source's emission estimates for 2 years are, for the most part, identical.[8] Because the systematic parameter uncertainties then cancel out, the uncertainty in an emission trend (e.g., the difference between the estimates for 2 years) is generally less than the uncertainty in total emissions for a single year. In such a situation, quantified uncertainty estimates can be treated as being comparable over time and used to track relative changes in the quality of a facility's emission estimates for that source category. Such estimates of uncertainty in emission trends can also be used as a guide for setting a facility's emissions reduction target. Trend uncertainty estimates are likely to be less useful for setting broader (e.g., organization-wide)

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[7] The role of expert judgment can be twofold: first, it can provide the data necessary to estimate the parameter, and second, it can help (in combination with data quality investigations) identify, explain, and quantify both statistical and systematic uncertainties.

[8] Biases may not be constant from year to year, instead exhibiting a pattern over time (e.g., growing or falling). For example, an organization that continues to disinvest in collecting high-quality data may create a situation in which the biases in its data get worse each year. These types of data quality issues are extremely problematic because of the effect they can have on calculated emission trends. In such cases, systematic parameter uncertainties cannot be ignored.

targets (see Chapter 11) because of the general problems with comparability between uncertainty estimates across gases, sources, and facilities.

Given these limitations, the role of qualitative and quantitative uncertainty assessments in developing GHG inventories includes the following:

- Promoting a broader learning and quality feedback process.
- Supporting efforts to qualitatively understand and document the causes of uncertainty and help identify ways of improving inventory quality. For example, collecting the information needed to determine the statistical properties of activity data and emission factors forces one to ask hard questions and to carefully and systematically investigate data quality.
- Establishing lines of communication and feedback with data suppliers to identify specific opportunities to improve the quality of the data and methods used.
- Providing valuable information to reviewers, verifiers, and managers for setting priorities for investments into improving data sources and methods.

The *Corporate Standard* has a supplementary guidance document on uncertainty assessments ("Guidance on uncertainty assessment in GHG inventories and calculating statistical parameter uncertainty") along with an uncertainty calculation tool, both of which are available on the GHG Protocol website. The guidance document describes how to use the calculation tool in aggregating uncertainties. It also discusses in more depth different types of uncertainties, the limitations of quantitative uncertainty assessment, and how uncertainty estimates should be properly interpreted.

Additional guidance and information on assessing uncertainty—including optional approaches to developing quantitative uncertainty estimates and eliciting judgments from experts—can also be found in EPA's Emissions Inventory Improvement Program, Volume VI: Quality Assurance/Quality Control (1999) and in Chapter 6 of the IPCC's Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories. (2000a).

Chapter 8
Accounting for Organizational GHG Reductions

GUIDANCE

As voluntary reporting, external GHG programs, and emission trading systems evolve, organizations need to understand the implications of accounting for offsets or credits that result from GHG reduction projects. This chapter elaborates on the different issues associated with the term "GHG reductions."

The *Corporate Standard* and *Public Sector Protocol* focus on accounting for and reporting GHG emissions at the company or organizational level. Reductions in organization emissions are calculated by comparing changes in the organization's actual emissions inventory over time relative to a base year. Focusing on overall organizational level emissions has the advantage of helping organizations manage their aggregate GHG risks and opportunities more effectively. It also helps focus resources on activities that result in the most cost-effective GHG reductions.

In contrast to corporate and organizational accounting, the *GHG Protocol Project Quantification Standard (Project Standard)* focuses on the quantification of GHG reductions from GHG mitigation projects that will be used as offsets. Offsets are discrete GHG reductions used to compensate for (i.e., offset) GHG emissions elsewhere, for example, to meet a voluntary or mandatory GHG target or cap. Offsets are calculated relative to a baseline that represents a hypothetical scenario for what emissions would have been in the absence of the project. However, it is important to note that offsets are a policy issue and that strict standards for the offset market have not been fully established.

Organization-Wide GHG Reductions at Facility, State, Region, or Country Level

From the perspective of the earth's atmosphere, where GHG emissions or reductions occur does not matter. From the perspective of national and international policymakers addressing global warming, the location where GHG is reduced is relevant because policies usually focus on achieving reductions within specific countries or regions, as spelled out, for example, in the Kyoto Protocol. Thus, public organizations with multistate, multinational, or multiregional operations have to respond to an array of state, national, or regional regulations and requirements that address GHGs from operations or facilities within a specific geographic area.

The *Corporate Standard* and *Public Sector Protocol* calculate GHG emissions using a bottom-up approach, which involves calculating emissions at the individual source or facility level and rolling them up to the headquarters level. Thus, an organization's overall emissions may decrease, even if increases occur at specific sources, facilities, or operations, and vice-versa. This bottom-up approach enables public organizations to report GHG emissions information at different scales, e.g., by individual sources or facilities, or by a collection of facilities within a given country. Public organizations can meet an array of regulatory requirements or voluntary commitments by comparing actual emissions over time for the relevant scale. On an organization-wide scale, this information can also be used when setting and reporting progress toward an organization-wide GHG target (see Chapter 11).

To track and explain changes in GHG emissions over time, organizations may find it useful to provide information on the nature of these changes. For example, the private company BP asks each of its reporting units to provide such information in an accounting movement format using the following categories (BP 2000):

- Acquisitions and divestments
- Closure
- Real reductions (e.g., efficiency improvements, material or fuel substitution)
- Change in production level
- Changes in estimation method
- Other.

Comment [W1]: Better public sector wording examples/wording of this?

BP then can summarize this type of information at the corporate level to provide an overview of the company's performance over time.

Reductions in Indirect Emissions

Reductions in indirect emissions (changes in scope 2 or 3 emissions over time) may not always capture the actual emissions reduction accurately. This is because the activity of the reporting organization does not always have a direct cause-effect relationship with the resulting GHG emissions. For example, a reduction in air travel would reduce an organization's scope 3 emissions. This reduction is usually quantified on the basis of an average emission factor of fuel use per passenger. However, how this reduction actually translates into a change in GHG emissions to the atmosphere depends on a number of factors, including whether another person takes the "empty seat" or whether this unused seat contributes to reduced air traffic over the longer term. Similarly, reductions in scope 2 emissions calculated with an average grid emissions factor may overestimate or underestimate the actual reduction, depending on the nature of the grid.

Generally, so long as the accounting of indirect emissions over time recognizes activities that in aggregate change global emissions, any such concerns over accuracy should not inhibit organizations from reporting their indirect emissions. In cases where accuracy is more important, undertaking a more detailed assessment of the actual reduction using a project quantification method may be appropriate.

Project-Based Reductions and Offsets/Credits

Project reductions that are to be used as offsets should be quantified using a project quantification method, such as the *Project Standard*, which addresses the following accounting issues:

- *Selection of a baseline scenario and emission*. The baseline scenario represents what would have happened in the absence of the project. Baseline emissions are the hypothetical emissions associated with this scenario. The selection of a baseline scenario always involves uncertainty because it represents a hypothetical scenario for what would have happened without the project. The project reduction is calculated as the difference between the baseline and project emissions. This differs from the way corporate or organizational reductions are measured in this document, i.e., in relation to an actual historical base year.

- *Demonstration of additionality*. This relates to whether the project has resulted in emission reductions or removals in addition to what would have happened in the absence of the project. If the project reduction is used as an offset, the quantification procedure should address additionality and demonstrate that the project itself is not the baseline and that project emissions are less than baseline emissions. Additionality ensures the integrity of the fixed cap or target for which the offset is used. Each reduction unit from a project used as an offset allows the organization or facility with a cap or target one additional unit of emissions. If the project were going to happen anyway (i.e., is non-additional), global emissions will be higher by the number of reduction units issued to the project.

- *Identification and quantification of relevant secondary effects*. These are GHG emissions changes resulting from the project not captured by the primary effects.[1] Secondary effects are typically the small, unintended GHG consequences of a project and include leakage (shifting GHG producing activities from a regulated entity or location to an unregulated entity or location) as well as changes in GHG emissions upstream and downstream of the project. If relevant, secondary effects should be incorporated into the calculation of the project reduction.

- *Consideration of reversibility*. Some projects achieve reductions in atmospheric CO_2 levels by capturing, removing, or storing carbon or GHGs in biological or non-biological sinks (e.g., forestry, land-use management, underground reservoirs). These reductions may be temporary in that the removed CO_2 may be returned to the atmosphere at some point in the future through intentional activities or accidental occurrences—such as harvesting

[1] Primary effects are the specific GHG reducing elements or activities (reducing GHG emissions, carbon storage, or enhancing GHG removals) that the project is intended to achieve.

of forestland or forest fires.[2] The risk of reversibility should be assessed, together with any mitigation or compensation measures included in the project design.

- *Avoidance of double counting*. To avoid double counting, the reductions giving rise to the offset must occur at sources or sinks not included in the target or cap for which the offset is used. Also, if the reductions occur at sources or sinks owned or controlled by someone other than the parties to the project (i.e., they are indirect), the ownership of the reduction should be clarified to avoid double counting.

Offsets may be converted into credits when used to meet an externally imposed target. Credits are convertible and transferable instruments usually bestowed by an external GHG program. They are typically generated from an activity such as an emissions reduction project and then used to meet a target in an otherwise closed system, such as a group of facilities with an absolute emissions cap placed across them. Although a credit is usually based on the underlying reduction calculation, the conversion of an offset into a credit is usually subject to strict rules, which may differ from program to program. For example, a Certified Emission Reduction (CER) is a credit issued by the Kyoto Protocol Clean Development Mechanism. Once issued, this credit can be traded and ultimately used to meet Kyoto Protocol targets. Experience from the “precompliance” market in GHG credits highlights the importance of delineating project reductions that are to be used as offsets with a credible quantification method capable of providing verifiable data.

Public sector organizations may not have the same opportunities as private companies to participate in market-based mandatory or voluntary GHG trading programs. Regulations often limit the ability of public sector organizations to keep revenue that may be generated from the sale of GHG credits. Taxpayers and legislators may also be hesitant to allow government budgets to be used to purchase offsets, for which guidelines and regulations are only beginning to emerge. Indeed, government agencies are often specifically excluded from participating in various GHG market activities (e.g. the California cap and trade program which is currently being developed). Specific legislation may be required to allow for public sector organizations to buy or sell offsets, as was the case when the U.S. House of Representatives purchased carbon offsets through the Chicago Climate Exchange for the Greening the Capitol Initiative.

[2] This problem with the temporary nature of GHG reductions is sometimes referred to as the “permanence” issue.

Trading GHG Emissions Reductions: Selling and buying at the federal level

Public sector managers are faced with a scarcity of funds available to implement efforts to reduce GHG emissions, and are more and more frequently looking towards the market place and business sector for innovative funding approaches. The NASA-Johnson Space Center (NASA-JSC) has capitalized on the market for NOx emission reduction credits to generate credits with a market value of $7-million (39 credits, each credit worth $180,000). These credits are linked to NASA-JSC's air pollution control permits. But to reap the benefits and make use of similar opportunities related to reducing their GHG emissions, clear authority must be granted to government managers.

What is necessary to trade in GHG emission reductions by the federal government sector? Ideally, there should be a specific authorizing statute with clear and unambiguous language that gives federal agencies the ability to trade (sell and buy) GHG emissions reductions. Additionally, specific and detailed regulations that define the scope and process would simplify and streamline federal efforts. Further, it would be preferable to have a General Counsel's written legal opinion or alternatively a U.S. Department of Justice – Attorney General's written legal opinion supporting federal action. Without the clarity provided by an authorizing statute, regulation, and a legal opinion, the participation of federal managers in market-based GHG emissions reductions programs will be limited.

Reporting Project-Based Reductions

Organizations should report their physical inventory emissions for their chosen inventory boundaries separately and independently from any GHG trades they undertake. GHG trades should be reported in an organization's public GHG report under optional information—either in relation to a target (see Chapter 11) or organization inventory (see Chapter 9).[3] Appropriate information addressing the credibility of purchased or sold offsets or credits should be included.

When organizations implement internal projects that reduce GHGs from their operations, the resulting reductions are usually captured in their inventory's boundaries. These reductions need not be reported separately unless they are sold, traded externally, or otherwise used as an offset or credit. However, some organizations may be able to make changes to their own operations that result in GHG emissions changes at sources not included in their own inventory boundary or not captured by comparing emissions changes over time. Examples include:

Comment [W2]: Examples of how these reductions could be revealed with rigorous Scope 3 accounting?

- Substituting fossil fuel with waste-derived fuel that might otherwise be used as landfill or incinerated without energy recovery. Such substitution may have no direct effect on (or may even increase) an organization's own GHG emissions. However, it could result in emissions reductions elsewhere by another organization, e.g., through avoiding landfill gas and fossil fuel use.

- Installing an on-site power generation plant (e.g., a combined heat and power, or CHP, plant) that provides surplus electricity to other organizations may increase an organization's direct emissions while displacing the

[3] The term "GHG trades" refers to all purchases or sales of allowances, offsets, and credits.

consumption of grid electricity by the organizations supplied. Any resulting emissions reductions at the plants where this electricity would have otherwise been produced will not be captured in the inventory of the organization installing the on-site plant.

- Substituting purchased grid electricity with an on-site power generation plant (e.g., CHP) may increase an organization's direct GHG emissions while reducing the GHG emissions associated with the generation of grid electricity. Depending on the GHG intensity and the supply structure of the electricity grid, this reduction may be overestimated or underestimated when merely comparing scope 2 emissions over time, if the latter are quantified using an average grid emission factor.

These reductions may be separately quantified, for example, using the processes described in the *Project Standard*, and reported in an organization's public GHG report under optional information in the same way as the GHG trades described above.

Pennsylvania: Taking advantage of renewable energy certificates

The Commonwealth of Pennsylvania is working with the Governors Green Government Council to implement a variety of strategies to reduce its GHG emissions. One approach has been to purchase renewable energy certificates, or RECs, to offset some of the Commonwealth's GHG emissions. RECs are an innovative method of providing renewable energy to individual customers; they also represent environmental benefits, such as avoided CO_2 emissions generated by producing electricity from renewable rather than fossil fuel sources. RECs can be sold bundled with the electricity (as green power) or separately to customers interested in supporting renewable energy initiatives.

The Commonwealth of Pennsylvania found that RECs offer a variety of advantages, including direct access to the benefits of renewable energy for facilities that may have limited renewable energy procurement options. Pennsylvania purchases a combination of wind and biomass RECs equivalent to 30 percent of the annual electricity use of its state facilities.

For more information on RECs, see the Green Power Market Development Group's Corporate Guide to Green Power Markets: Installment #5 (WRI, 2003).

Chapter 9
Reporting GHG Emissions

STANDARD

A credible GHG emissions report presents relevant information that is complete, consistent, accurate, and transparent. While it takes time to develop a rigorous and complete organizational inventory of GHG emissions, knowledge will improve with experience in calculating and reporting data. Therefore, a public GHG report should:

- Be based on the best data available at the time of publication, while being transparent about its limitations;
- Communicate any material discrepancies identified in previous years; and
- Include the organization’s gross emissions for its chosen inventory boundary separate from and independent of any GHG trades or reductions in which it might engage.

The standards and guidance here are designed to be an overview of essential components in a GHG report. However, many agencies will develop their GHG reports according to requirements specified in legislation or internal management systems. Appendix C summarizes the requirements of various GHG programs. For those agencies that are currently developing reporting policies, the key components listed here can serve as a foundation for inventory information.

Required Information

This *Public Sector Protocol* requires reporting scope 1 and scope 2 emissions at a minimum. A public GHG emissions report that is in accordance with the *Public Sector Protocol* shall include the information in the following subsections:

DESCRIPTION OF ORGANIZATION AND INVENTORY BOUNDARIES

This description includes the following:

- An outline of the organizational boundaries chosen, including the chosen consolidation approach
- An outline of the operational boundaries chosen, and if scope 3 is included, a list specifying the types of activities covered

- The reporting period covered.

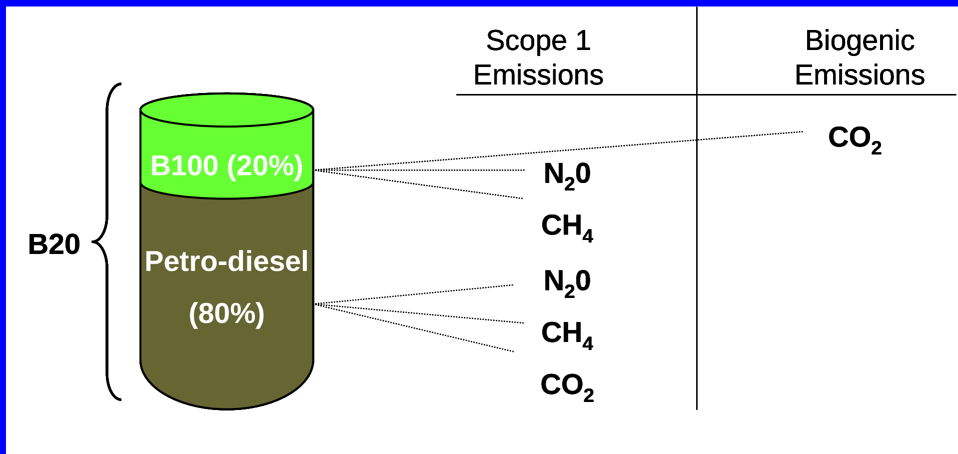
Information on Emissions

This information includes the following:

- Emissions data for all six GHGs separately (CO_2, CH_4, N_2O, HFCs, PFCs, and SF_6) in metric tons, and also in tons of carbon dioxide equivalent (CO_2-eq)
- Emissions data separately for each scope (Scope 1 and 2 required, Scope 3 is optional)
- Total scope 1 and 2 emissions, independent of any GHG trades such as sales, purchases, transfers, or banking of allowances
- Emissions data for direct CO_2 emissions from the combustion of biologically sequestered carbon (e.g., CO_2 from burning biomass or biofuels), reported separately from the scopes
- Year chosen as base year (designated as calendar year or fiscal year), and an emissions profile over time that is consistent with and clarifies the chosen policy for making base-year emissions recalculations
- Appropriate context for any significant emissions changes that trigger base-year emissions recalculation (subsuming or shedding resources and responsibilities, outsourcing or insourcing, changes in reporting boundaries or calculation methods, etc.)
- Methods used to calculate or measure emissions, providing a reference or link to any calculation tools used
- Any specific exclusion of sources, facilities, programs, or operations (for example, for exemptions required for national security).

Calculating Emissions from Bio-Diesel

Bio-diesel is an alternative, a non-petroleum diesel made from renewable resources like vegetable oil and animal fats. Pure biodiesel, also known as B100, is commonly combined with various amounts of petro-diesel to create a blended product. A common blend, B20, consists of 20 percent bio-diesel and 80 percent petro-diesel. Such intermingling of fuels complicates the accounting of GHG emissions. In order to calculate B20's combustion emissions, a percentage breakdown into its fuel constituents (i.e., Petro-diesel & B100) is required. The 80% petro-diesel within the B20 blend is considered a non-renewable, anthropogenic fossil fuel; its emissions of N_20, CH_4, and CO_2 should all be reported under scope 1 within the appropriate organizational boundaries. However, combustion of the 20% bio-diesel contained in the B20 blend is accounted for in two places: both in scope 1, and in the separately reported "biogenic" emissions category.[a] Because the CO_2 released from the B100 component of the blend is "recycled" during the growth phase of B100's life cycle, it is reported separately. But he NO_2 and CH_4 released from that same B100 fraction are not recycled in the same way, and they are reported as scope 1.



[a] Biogenic emissions are those that result from the combustion of materials that naturally sequester CO_2, such as biomass, or biofuels derived from vegetable oils or animal fats.

Optional Information

A public GHG emissions report should include, when applicable, the following additional information.

Information on Emissions and Performance

This information includes the following:

- Emissions data from relevant scope 3 emissions activities for which reliable data can be obtained
- Emissions data further subdivided, where this aids transparency, by program, facilities, location, source types (stationary combustion, process, fugitive, etc.), and activity types (production of electricity, transportation, generation of purchased electricity that is sold to end users, etc.)

- Emissions attributable to own generation of electricity, heat, or steam that is sold or transferred to another organization (see Chapter 4)

- Emissions attributable to the generation of electricity, heat, or steam that is purchased for resale to non-end users (see Chapter 4)

- A description of performance measured against internal and external benchmarks

- Emissions from GHGs not covered by the Kyoto Protocol (e.g., CFCs, NOx), reported separately from scopes

- Relevant ratio performance indicators (e.g., emissions per kilowatt-hour or emissions per unit of service provided) (see Chapter 11)

- An outline of any GHG management or reduction programs or strategies

- Information on any contractual provisions addressing GHG-related risks and obligations

- An outline of any external assurance provided and a copy of any verification statement, if applicable, of the reported emissions data

- Information on the causes of emissions changes that did not trigger a base-year emissions recalculation (e.g., process changes, efficiency improvements, plant closures)

- GHG emissions data for all years between the base year and the reporting year (including details of and reasons for recalculations, if appropriate)

- Information on the quality of the inventory (e.g., information on the causes and magnitude of uncertainties in emission estimates) and an outline of policies in place to improve inventory quality (see Chapter 7)

- Information on any GHG sequestration

- A list of facilities included in the inventory

- A contact person.

INFORMATION ON OFFSETS

This information should include the following:

- Information on allowable offsets that have been purchased or developed outside the inventory boundary, subdivided by GHG storage or removals and emissions reduction projects, including specification whether the offsets are verified or certified (see Chapter 8) or approved by an external GHG program (e.g., the Clean Development Mechanism, Joint Implementation)

- Information on reductions at sources inside the inventory boundary that have been sold or transferred as offsets to a third party, when allowed, including specification whether the reduction has been verified or certified or approved by an external GHG program (see Chapter 8).

GUIDANCE

By following the *Public Sector Protocol* reporting requirements, users adopt a comprehensive standard with the necessary detail and transparency for credible public reporting. The reporting of optional information can be determined by the objectives and intended audience for the report.

Not every circulated report must contain all information as specified by this standard, but a link or reference should be made to a publicly available full report where all information is available. For some organizations, providing emissions data for specific GHGs or facilities or programs, or reporting ratio indicators, may compromise confidentiality or national security. If this is the case, the data need not be publicly reported, but can be made available to those auditing the GHG emissions data, assuming confidentiality and security are assured. In contrast, other agencies have found that exposing their raw, disaggragated data as well as their final reports to multiple audiences provided critical cross-fact checking and feedback.

All organizations should strive to create a report that is as transparent, accurate, consistent, and as complete as possible. Structurally, this may be achieved by adopting the reporting categories of the standard (e.g., required description of the organization and inventory boundary, required information on organization emissions, optional information on emissions and performance, and optional information on offsets) as a basis of the report. Qualitatively, including a discussion of the reporting organization’s strategy and goals for GHG accounting, any particular challenges or tradeoffs faced, the context of decisions on boundaries and other accounting parameters, and an analysis of emissions trends may help provide a complete picture of the organization’s inventory efforts.

Use of Ratio Indicators

Two principal aspects of GHG performance are of interest to management and stakeholders. One concerns the overall GHG impact of an organization—that is, the absolute quantity of GHG emissions released to the atmosphere. The other concerns the organization’s GHG emissions normalized by some operational metric that results in a “ratio indicator.” The *Public Sector Protocol* requires reporting of absolute emissions; reporting of ratio indicators is optional. Ratio indicators provide information on performance relative to operational activities, and can facilitate comparisons between similar organizations and processes over time. Organizations may choose to report GHG ratio indicators in order to:

- Evaluate performance over time, e.g., relate figures from different years, identify trends in the data, and show performance in relation to targets and base years (see Chapter 11);
- Establish a relationship between data from different categories, for example, an organization may want to establish a relationship between its organizational goals (e.g., tons of mail delivered) and its impact on society or on the environment (e.g., emissions from mail distribution); and
- Improve comparability between different sizes of operations by normalizing figures (e.g., by assessing the impact of different sized organizations on the same scale).

The public sector is inherently diverse, and the circumstances of individual organizations can result in misleading indicators. Organizations should develop ratios that make sense for their activities and are relevant to their decision-making needs, and that best capture the benefits and impacts of their work, i.e., its operations, services, and effects on the marketplace and on the entire economy. s Sub-units within an agency or division should coordinate the reporting of ratio indicators to ensure the indicator's relevance and consistency where possible.

Some examples of different ratio indicators are provided here and in Chapter 11.

Productivity or Efficiency Ratios

Productivity or efficiency ratios express the value or achievement of an organization divided by its GHG impact. Increasing efficiency ratios reflect a positive performance improvement. Examples of productivity ratios include resource productivity (e.g., unit of service provided per GHG) and process eco-efficiency (e.g., production volume per amount of GHG).

Intensity Ratios

Intensity ratios express GHG impact per unit of physical activity or unit of productivity. A physical intensity ratio is suitable when aggregating or comparing across organizations that have similar output or missions. An economic intensity ratio is suitable when aggregating or comparing across organizations that have differing operations. A declining intensity ratio reflects a positive performance improvement. Many track environmental performance with intensity ratios, often called "normalized" environmental impact data. Examples of intensity ratios include product emission intensity (e.g., tons of CO_2 emissions per electricity generated) and service intensity (e.g., GHG emissions per function or per service).

PERCENTAGES

A percentage indicator is a ratio between two similar issues (with the same physical unit in the numerator and the denominator). Examples of percentages that can be meaningful in performance reports include current GHG emissions expressed as a percentage of base year GHG emissions.

For further guidance on ratio indicators, refer to CCAR, 2003; GRI, 2002; and Verfaillie and Bidwell, 2000.

Chapter 10
Verification of GHG Emissions

GUIDANCE

Verification is an objective assessment of the accuracy and completeness of reported GHG information and its conformance to pre-established GHG accounting and reporting principles. Although the practice of verifying organization GHG inventories is still evolving, the emergence of widely accepted standards, such as the *Corporate Standard*, this *Public Sector Protocol*, and the *GHG Protocol for Project Accounting*, should help GHG verification become more uniform, credible, and widely accepted.

This chapter provides an overview of the key elements of a GHG verification process. It is relevant to organizations that are developing GHG inventories and have planned for, or are considering, obtaining an independent verification of their results and systems. It is critical for public sector organizations that face potential conflict of interest issues when selecting contractors to provide inventory and verification services. This chapter is also important for government agencies that may be charged with the verification, auditing, or compliance enforcement. Furthermore, as the process of developing a verifiable inventory is largely the same as that for obtaining reliable and defensible data, this chapter is also relevant to all organizations regardless of any intention to commission a GHG verification.

Verification involves an assessment of the risks of material discrepancies in reported data. Discrepancies relate to differences between reported data and data generated from the proper application of the relevant standards and methods. In practice, verification involves the prioritization of effort by the verifier toward the data and associated systems that have the greatest impact on overall data quality.

Relevance of GHG Principles

The primary aim of verification is to provide confidence to users that the reported information and associated statements represent a faithful, true, and fair account of an organization's GHG emissions. Ensuring transparency and verifiability of the inventory data is crucial for verification. The more transparent, well controlled, and well documented an organization's emissions data and systems are, the more efficient it will be to verify. As outlined in Chapter 1, a number of GHG accounting and reporting principles need to be followed when compiling a GHG inventory. Adherence to these principles and the presence of a transparent, well-documented system (sometimes referred to as an audit trail) are the basis of a successful verification. While transparency is essential, some organizations and agencies may need to restrict the release of some information due to state or national security concerns with its release.

Goals

Before commissioning an independent verification, an organization should clearly define its goals and decide whether they are best met by an external verification. Common reasons for undertaking a verification include the following:

- Increased credibility of publicly reported emissions information and progress toward GHG targets, leading to enhanced stakeholder trust
- Increased senior management confidence in reported information on which to base investment and target-setting decisions
- Improvement of internal accounting and reporting practices (e.g., calculation, recording, and internal reporting systems and the application of GHG accounting and reporting principles) and facilitating learning and knowledge transfer within the organization
- Preparation for mandatory verification requirements of GHG programs
- Responding to reporting requests or mandates from other sectors (e.g., states reporting to the federal government).

Internal Assurance

As noted in Chapter 7, a quality GHG inventory requires a thorough “first party” review of data and procedures as a basic level of verification. Verification is often, but not always, also undertaken by an independent, external “third party” verifier. For external stakeholders, external third-party verification is likely to significantly increase the credibility of the GHG inventory. Third-party reviews bring unbiased expert analysis to bear, providing a level of confidence to stakeholders that formal procedures and reliable data have been utilized and reported.

Many organizations interested in improving their GHG inventories may also subject their information to internal verification by personnel independent of the GHG accounting and reporting process through a “second party” verification process. Both internal and external verification should follow similar procedures and processes. However, independent internal verifications can also provide valuable assurance over the reliability of information. Internal verification can be a worthwhile learning experience for an organization prior to commissioning an external verification by a third party. It can also provide external verifiers with useful information to begin their work.

Concept of Materiality

The concept of “materiality” is essential to understanding the process of verification. Chapter 1 provides a useful interpretation of the relationship between the principle of completeness and the concept of materiality. Information is considered to be material if, by its inclusion or exclusion, it can be seen to influence any decisions or actions taken by users of it. A material discrepancy is an error (for example, from an oversight, omission, or miscalculation) that results in a reported quantity or statement significantly differing from the true value or meaning. To express an opinion on data or information, a verifier would need to form a view on the materiality of all identified errors or uncertainties.

While the concept of materiality involves a value judgment, the point at which a discrepancy becomes material (materiality threshold) is usually predefined. As a rule of thumb, an error is considered to be materially misleading if its value exceeds 5 percent of the total inventory for the part of the organization being verified.

The verifier needs to assess an error or omission in the full context in which information is presented. For example, if a 2 percent error prevents an organization from achieving its organizational target, this would most likely be considered material. Understanding how verifiers apply a materiality threshold enables companies to more readily establish whether the omission of an individual source or activity from their inventory is likely to raise questions of materiality.

Materiality thresholds may also be outlined in the requirements of a specific GHG program or determined by a national verification standard, depending on the entity requiring the verification and the reasons. A materiality threshold provides guidance to verifiers on what may be an immaterial discrepancy so that they can concentrate their work on areas that are more likely to lead to materially misleading errors. A materiality threshold is not the same as de minimis emissions, or a permissible quantity of emissions that an organization can leave out of its inventory.

Assessing Risk of Material Discrepancy

Verifiers need to assess the risk of material discrepancy of each component of the GHG information collection and reporting process. This assessment is used to plan and direct the verification process. In assessing this risk, they consider a number of factors, including the following:

- The structure of the organization and the approach used to assign responsibility for monitoring and reporting GHG emissions
- The approach and commitment of management to GHG monitoring and reporting

- Development and implementation of policies and processes for monitoring and reporting (including documented methods explaining how data are generated and evaluated)
- Processes used to check and review calculation methods
- The complexity and nature of operations
- The complexity of the computer information system used to process the information
- The type, state of calibration, and maintenance of meters used
- The reliability and availability of input data
- Assumptions and estimations applied
- Aggregation of data from different sources
- Other assurance processes to which the systems and data are subjected (e.g., internal audit and external reviews and certifications).

Establishing Verification Parameters

The scope of an independent verification and the level of assurance it provides are influenced by the organization's goals or any specific jurisdictional requirements. This scope may be predefined by legislation or guidance for public agencies. The verification provider may also be determined by law or regulation.

Verifying the entire GHG inventory or specific parts is possible. Discrete parts may be specified in terms of geographic location, operating units, facilities, and type of emissions. The verification process may also examine more general managerial issues, such as quality management procedures, managerial awareness, availability of resources, clearly defined responsibilities, segregation of duties, and internal review procedures.

The organization and verifier should reach an agreement upfront on the scope, level, and objective of the verification. This agreement (often referred to as the scope of work) will address issues such as the information to be included in the verification (e.g., head office consolidation only or information from all sites), the level of scrutiny to which selected data will be subjected (e.g., desk top review or on-site review), and the intended use of the results of the verification. The materiality threshold is another item to be considered in the scope of work. It is a key consideration for both the verifier and the organization and is linked to the objectives of the verification.

The scope of work is influenced by what the verifier actually finds once the verification commences and, as a result, the scope of work must remain sufficiently flexible to enable the verifier to adequately complete the verification.

A clearly defined scope of work is not only important to the organization and verifier, but also for external stakeholders to be able to make informed and appropriate decisions. Verifiers ensure that specific exclusions have not been made solely to improve the organization's performance. To enhance transparency and credibility, organizations should make the scope of work publicly available.

Site Visits

Depending on the level of assurance required from verification, verifiers may need to visit a number of sites to enable them to obtain sufficient, appropriate evidence over the completeness, accuracy, and reliability of reported information. The sites visited should be representative of the organization as a whole. The selection of sites to be visited is based on consideration of a number of factors, including the following:

- Nature of the operations and GHG sources at each site
- Complexity of the emissions data collection and calculation process
- Percentage contribution to total GHG emissions from each site
- The risk that the data from sites are materially misstated
- Security requirements of sites (e.g., restrictions)
- Competencies and training of key personnel
- Results of previous reviews, verifications, and uncertainty analyses.

Timing of the Verification

A verifier can be engaged at various points during the GHG preparation and reporting process. Some organizations may establish a semipermanent internal verification team to ensure that GHG data standards are continuously met and improved.

Verification during a reporting period allows for any reporting deficiencies or data issues to be addressed before the final report is prepared. This may be particularly useful for organizations preparing high-profile public reports. However, some GHG programs may require, often on a random selection basis, an independent verification of the GHG inventory following the submission of a report (e.g., World Economic Forum Global GHG Registry, Greenhouse Challenge program in Australia, EU ETS). Verification timing may also be established by government regulation, law, or EO. In all cases, the verification cannot be closed out until the final data for the period has been submitted.

PricewaterhouseCoopers (PWC): GHG inventory verification—lessons from the field

PwC, a global services company, has been conducting GHG emissions verifications for the past 10 years in various sectors, including energy, chemicals, metals, semiconductors, and pulp and paper. PwC's verification process involves two key steps:

1. An evaluation of whether the GHG accounting and reporting method (e.g., the *Corporate Standard*) has been correctly implemented.

2. Identification of any material discrepancies.

The *Corporate Standard* has been crucial in helping PwC design an effective GHG verification method. Since the publication of the first edition, PwC has witnessed rapid improvements in the quality and verifiability of GHG data reported. In particular the quantification on non-CO_2 GHGs and combustion emissions has dramatically improved. Cement sector emissions verification has been made easier by the release of the WBCSD cement sector tool. GHG emissions from purchased electricity are also easy to verify since most companies have reliable data on MWh consumed and emission factors are publicly available.

However, experience has shown that for most companies, GHG data for 1990 is too unreliable to provide a verifiable base year for the purposes of tracking emissions over time or setting a GHG target. Challenges also remain in auditing GHG emissions embedded in waste fuels, cogeneration, passenger travel, and shipping.

Over the past 3 years, PwC has noticed a gradual evolution of GHG verification practices from "customized" and "voluntary" to "standardized" and "mandatory." The CCAR, World Economic Forum Global GHG Registry, and the EU ETS (covering 12,000 industrial sites in Europe) require some form of emissions verification. In the EU ETS, GHG verifiers have to be accredited by a national body. GHG verifier accreditation processes have already been established in the United Kingdom for its

Selecting a Verifier

Factors to consider when selecting a verifier include their

- previous experience and competence in undertaking GHG verifications;
- understanding of GHG issues, including calculation methods;
- understanding of the organization's operations and industry; and
- objectivity, credibility, and independence.

The knowledge and qualifications of the individuals conducting the verification can be more important than those of the organizations from which they come. Large organizations may actually have a predefined internal verifier established by a regulation, law, or EO. In cases where the verifier is not pre-defined, organizations should select groups on the basis of the knowledge and qualifications of their actual verifiers and ensure that the lead verifier assigned is appropriately experienced. Effective verification of GHG inventories often requires a mix of specialized skills, not only at a technical level (e.g., engineering experience, industry specialists), but also at an operational level (e.g., verification and industry specialists).

Preparing for GHG Verification

The internal processes described in Chapter 7 are likely to be similar to those followed by an independent verifier. Therefore, the materials that the verifiers need are similar. Some of these records may be maintained by agencies or groups within the same government. Information required by an external verifier is likely to include the following:

- Information about the organization’s main activities and GHG emissions (types of GHG produced, description of activity that causes GHG emissions)
- Information about the organization and groups (list of subsidiaries and their geographic location, ownership structure, financial entities within the organization)
- Details of any changes to organizational boundaries or processes during the period, including justification for the effects of these changes on emissions data
- Details of joint venture agreements, outsourcing and contractor agreements, production sharing agreements, emissions rights and other legal or contractual documents that determine the organizational and operational boundaries
- Documented procedures for identifying sources of emissions within the organizational and operational boundaries
- Information on other assurance processes to which the systems and data are subjected (e.g., internal audit, external reviews and certifications)
- Data used for calculating GHG emissions. This might, for example, include the following:
    - Energy consumption data (invoices, delivery notes, weighbridge tickets, meter readings: electricity, as pipes, steam, and hot water, etc.)
    - Production data (tons of material produced, kilowatts per hour of electricity produced, etc.)
    - Raw material consumption data for mass balance calculations (invoices, delivery notes, weighbridge tickets, etc.)

- Emission factors (laboratory analysis, etc.)

- Description of how GHG emissions data have been calculated:
  - Emission factors and other parameters used and their justification
  - Assumptions on which estimations are based
  - Information on the measurement accuracy of meters and weigh-bridges (e.g., calibration records) and other measurement techniques
  - Equity share allocations and their alignment with financial reporting
  - Documentation on any GHG sources or activities excluded due to, for example, technical or cost reasons

- Information gathering process
  - Description of the procedures and systems used to collect, document, and process GHG emissions data at the facility and organization level
  - A roadmap documenting files (including filenames) containing the raw activity data, intermediate processed data and final calculations
  - Description of quality control procedures applied (internal audits, comparison with last year's data, recalculation by second person, etc.)

- Other information
  - Selected consolidation approach as defined in Chapter 3
  - List of (and access to) persons responsible for collecting GHG emissions data at each site and at the organizational level (name, title, e-mail, and telephone numbers)
  - Information on uncertainties, qualitative and, if available, quantitative.

Appropriate documentation needs to be available to support the GHG inventory being subjected to external verification. Statements made by management for which no supporting documentation is available cannot be verified. When a reporting organization has not yet implemented systems for routinely accounting and recording GHG emissions data, an external verification is difficult and may result in the verifier being unable to issue an opinion. Under these circumstances, the verifiers may make recommendations on how current data collection and collation process should be improved so that an opinion can be obtained in future years.

Organizations are responsible for ensuring the existence, quality, and retention of documentation to create an audit trail of how the inventory was compiled. If an organization issues a specific base year against which it assesses its GHG performance, it should retain all relevant historical records to support the base-year data. These issues should be born in mind when designing and implementing GHG data processes and procedures.

Using the Verification Findings

Before the verifiers verify that an inventory has met the relevant quality standard, they may require the organization to adjust any material errors that they identified during the course of the verification. If the verifiers and the organization cannot agree on the adjustments, the verifier may not be able to provide the organization with an unqualified opinion. All material errors (individually or in aggregate) need to be amended prior to the final verification sign off.

As well as issuing an opinion on whether the reported information is free from material discrepancy, the verifiers may, depending on the agreed upon scope of work, also issue a verification report containing a number of recommendations for future improvements. The process of verification should be viewed as a valuable input to the process of continual improvement. Other agencies, outside of the organization, may have responsibilities for improving the recording and reporting process as well. Whether verification is undertaken for the purposes of internal review, public reporting, or certifying compliance with a particular GHG program, it is likely to contain useful information and guidance on how to improve and enhance an organization's GHG accounting and reporting system.

Similar to the selected verifiers, those selected to assess and implement responses to the verification findings should also have the appropriate skills and understanding of GHG accounting and reporting issues.

Chapter 11
Setting a GHG Target

GUIDANCE

Setting targets is a routine practice that helps ensure that an issue has senior management's attention and is factored into relevant decisions about the services provided, and the materials and technologies to use. Often, an organizational GHG emission reduction target is the logical follow-up to developing a GHG inventory.

Within an organization's target, there may be operating unit goals. Further, within an operating unit, goals can be set for specific operations or locations. While setting targets may be within the authority of many organizations, the targets may also be imposed on an organization from a higher public-sector organization.

This chapter provides guidance on the process of setting and reporting on an organizational GHG target. Although the chapter focuses on emissions, many of the considerations equally apply to GHG sequestration (see Appendix B). This chapter does not prescribe an organization's target, but focuses on the steps involved, choices to be made, and implications of those choices.

Why Set a GHG Target?

Any robust public sector performance strategy requires setting targets for productivity, mission accomplishment, and other core indicators, as well as tracking performance against those targets. Likewise, effective GHG management involves setting a GHG target. As organizations develop strategies to reduce the GHG emissions of their products and operations, organization-wide GHG targets are often key elements of these efforts, even if some parts of the organization are or will be subject to mandatory GHG limits. Common drivers for setting a GHG target include the following:

- *Minimizing and managing GHG risks*. While developing a GHG inventory is an important step toward identifying GHG risks and opportunities, a GHG target is a planning tool that can drive GHG reductions. A GHG target helps raise internal awareness about the risks and opportunities presented by climate change, and ensures the issue is on the operational agenda. This can serve to minimize and more effectively manage the risks associated with climate change.

- *Saving costs and stimulating innovation*. Implementing a GHG target can result in cost savings by driving improvements in process innovation and resource efficiency. Targets that apply to products can drive research and development, which in turn creates products and services that can improve services and reduce emissions associated with the use of facilities.

- *Preparing for future regulations*. Internal accountability and incentive mechanisms established to support a target's implementation can also equip organizations to respond more effectively to future GHG regulations. For example, some companies have found that experimenting with internal GHG trading programs has allowed them to better understand the possible impacts of future trading programs on the organization. Similar initiatives could be undertaken in the public sector.

- *Demonstrating leadership and organizational responsibility*. With the emergence of GHG regulations in many parts of the world, as well as growing concern about the effects of climate change, publicizing a GHG target demonstrates leadership and organizational responsibility. This can improve an organization's standing and enhance reputation with taxpayers, employees, stakeholders, partners, and the general public.

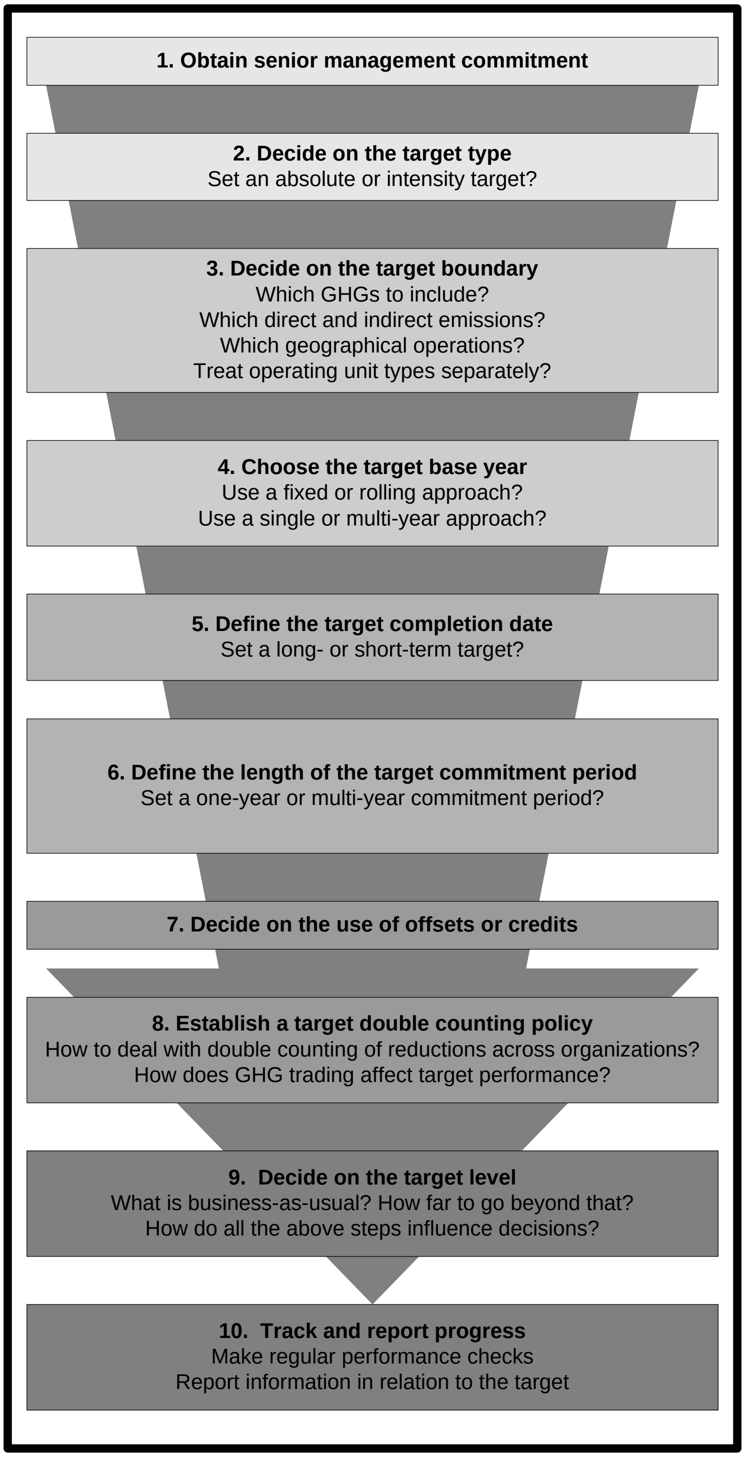
- *Participating in voluntary programs*. A growing number of voluntary GHG programs are emerging to encourage and assist organizations in setting, implementing, and tracking progress toward GHG targets. Participation in voluntary programs can result in public recognition, may facilitate recognition of early action under future regulations, and enhance an organization's GHG accounting and reporting capacity and understanding.

Steps in Setting a Target

Setting a GHG target involves making choices among various strategies for defining and achieving a GHG reduction. The organizational goals, any relevant policy context, and stakeholder discussions should inform these choices.

The following sections outline the 10 steps involved. Although presented sequentially, in practice target setting involves cycling back and forth between the steps. The organization is assumed to have developed a GHG inventory before implementing these steps. However, due to the nature of public-sector management, an EO or legislation could impose both simultaneously. Figure 11-1 summarizes the steps.

Figure 0-1. Steps in Setting a GHG Target



1. Obtain Senior Management Commitment

As with any organization-wide target, senior management buy-in and commitment, particularly at the highest level, are prerequisites for a successful GHG reduction program. Implementing a reduction target is likely to necessitate changes in behavior and decision making throughout the organization. It also requires establishing an internal accountability and incentive system and providing adequate resources to achieve the target. This will be difficult, if not impossible, without senior management commitment.

If a target is imposed, it may be necessary for a senior manager to understand the intricacies of an organization's GHG management plan. For example, the boundaries set (see Chapters 3 and 4) may carry legal implications. Some elements of the program may be prescribed by regulations so adherence to these regulations will be part of official responsibilities. Delegation of responsibilities and accountability must be agreed at the senior management level.

Finally, while commitment from senior management is crucial, the setting and successful attainment of emissions reduction goals requires buy-in at all levels of an organization, as well as behavioral changes on the ground. Successful GHG mitigation strategies are embedded within the fabric of an organization's day-to-day operations.

2. Decide on the Target Type

There are two broad types of GHG targets: absolute and intensity-based. Targets can be imposed by external regulation or determined internally in an organization. An absolute target is usually expressed in terms of a reduction over time in a specified quantity of GHG emissions to the atmosphere, the unit typically being ton of CO_2-eq (such as reducing CO_2 by 25 percent below 1994 levels by 2010). An intensity target is usually expressed as a reduction in the ratio of GHG emissions relative to another operational metric over time (such as reducing CO_2 by 12 percent per hospital bed provided between 2000 and 2008).[1]

The comparative metric should be carefully selected. The Government Accounting Standards Board offers important guidance on the selection of measures of productivity, effectiveness, quality, and timeliness. The metric chosen can be the output of the organization (e.g., ton CO_2-eq per blighted home restored, per student educated, or per mile road paved) or some other metric such as office space. To facilitate transparency, organizations using an intensity target shall also report the absolute emissions from sources covered by the target. Table 11-1 summarizes the advantages and disadvantages of each type of target, and provides examples. Some organizations have both an absolute and an intensity target.

[1] Some organizations set GHG targets by formulating this ratio the other way around.

Table 0-1. Comparing Absolute and Intensity Targets

➤ Advantages	➤ Disadvantages	➤ Examples
➤ Absolute targets		
Designed to achieve a reduction in a specified quantity of GHGs emitted to the atmosphere Environmentally robust, entailing a commitment to reduce GHGs by a specified amount Transparently address potential stakeholder concerns about the need to manage absolute emissions	Target base year recalculations for significant structural changes to the organization add complexity to tracking progress over time Do not allow comparisons of GHG intensity or efficiency Recognize an organization for reducing GHGs by decreasing production or output (organic decline, see Chapter 5) May be difficult to achieve if the organization grows unexpectedly and growth is linked to GHG emissions	Tons CO_2 Tons CH_4 Tons CO_2-eq
➤ Intensity targets		
Reflect GHG performance improvements independent of organic growth or decline Target base year recalculations for structural changes are usually not required (see step 4) May increase the comparability of GHG performance among organizations	No guarantee that GHG emissions to the atmosphere will be reduced—absolute emissions may rise even if intensity goes down and output increases Organizations with diverse operations may find it difficult to define a single common metric If a monetary variable is used for the metric, it must be recalculated for changes in inflation, adding complexity to the tracking process Especially sensitive to inaccuracies in the underlying data. Public organizations should take particular care to ensure that these data are reliable, complete and accurate.	Tons CO_2-eq/square foot of warehouse space Tons CO_2-eq/tons of mail delivered Tons CO_2-eq/number of employees Tons CO_2-eq/square foot/person Tons CO_2-eq/$ appropriated Tons CO_2-eq/megawatt hour of electricity produced CO_2-eq/British thermal unit Tons CO_2-eq/park visitor Tons CO_2-eq/mile of highway constructed

3. DECIDE ON THE TARGET BOUNDARY

The target boundary defines which GHGs, geographic operations, sources, and activities are covered by the target. The target and inventory boundary can be identical, or the target may address a specified subset of the sources included in the organization inventory. The quality of the GHG inventory should be a key factor informing this choice. The questions to be addressed in this step include the following:

- *Which GHGs*? Targets usually include one or more of the six major GHGs covered by the Kyoto Protocol. For organizations with significant non-CO_2 GHG sources, it usually makes sense to include these to increase the range of reduction opportunities. However, practical monitoring limitations may apply to smaller sources.

- *Which direct and indirect emission sources*? Including indirect GHG emissions in a target will facilitate more cost-effective reductions by increasing the reduction opportunities available. However, indirect emissions are generally harder to measure accurately and verify than direct emissions although some categories, such as scope 2 emissions from purchased electricity, may be amenable to accurate measurement and verification. Including indirect emissions can raise issues with regard to ownership and double counting of reductions, as indirect emissions are by definition someone else's direct emissions (see step 8).

- *Which geographical operations*? Only country or regional operations with reliable GHG inventory data should be included in the target. For organizations with global operations, it makes sense to limit the target's geographical scope until a robust and reliable inventory has been developed for all operations. Organizations that participate in GHG programs involving trading need to decide whether or not to include the emissions sources covered in the trading program in their organizational target.[2] If common sources are included, i.e., if there is overlap in sources covered between the organization target and the trading program, organizations should consider how they will address any double counting resulting from the trading of GHG reductions in the trading program (see step 8).

- *Separate targets for different types of operations*? For organizations with diverse operations, it may make more sense to define separate GHG targets for different core activities, especially when using an intensity target, where the most meaningful metric for defining the target varies across operating units (e.g., GHGs per ton of cement produced or barrel of oil refined).

4. Choose the Target Base Year

For a target to be credible, how target emissions are defined in relation to past emissions has to be transparent. Two general approaches are available: a fixed target base year or a rolling target base year.

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[2] Examples include the UK ETS, the CCX, and the EU ETS.

- *Using a fixed target base year*. Most GHG targets are defined as a percentage reduction in emissions below a fixed target base year (e.g., reduce CO_2 emissions 25 percent below 1994 levels by 2010). Chapter 5 describes how organizations should track emissions in their inventory over time in reference to a fixed base year. Although using different years for the inventory base year and the target base year is possible, to streamline the inventory and target reporting process, it usually makes sense to use the same year for both. As with the inventory base year, ensuring the emissions data for the target base year are reliable and verifiable is important. Using a multiyear average target base year is also possible, and the same considerations as described for multiyear average base years in Chapter 5 apply.

  Chapter 5 provides standards on when and how to recalculate base year emissions to ensure like-with-like comparisons over time when structural changes (e.g., acquisitions or divestitures) or changes in measurement and calculation methods alter the emissions profile over time. In most cases, this will also be an appropriate approach for recalculating data for a fixed target base year.

- *Using a rolling target base year*. Organizations may consider using a rolling target base year if obtaining and maintaining reliable and verifiable data for a fixed target base year is likely to be challenging (for example, due to frequent acquisitions). With a rolling target base year, the base year rolls forward at regular intervals, usually 1 year, so that emissions are always compared with the previous year.[3] However, emission reductions can still be collectively stated over several years. An example would be "from 2001 through 2012, emissions will be reduced by 1 percent every year, compared to the previous year." When the structure or method changes, recalculations only need to be made to the previous year.[4] As a result, the emission inventories in the "target starting year" (2001 in the example) are not comparable with those of the "target completion year" (2012 in the example), because the former have not been corrected for structural or methodological changes, whereas the latter have been. In contrast, the current inventory is always comparable with the inventory for the preceding inventory period (the base year).

The definition of what triggers a base-year emissions recalculation is the same as under the fixed base year approach. The difference lies in how far back emissions are recalculated. Table 11-2 compares targets using the

[3] Using an interval other than 1 year is possible, but the longer the interval at which the base year rolls forward, the more this approach becomes like a fixed target base year. This discussion is based on a rolling target base year that moves forward at annual intervals.

[4] For further details on different recalculation methods, see the guidance document "Base year recalculation methodologies for structural changes" on the GHG Protocol website (www.ghgprotocol.org).

rolling and fixed base year approaches, and Figure 11-2 illustrates one of the key differences.

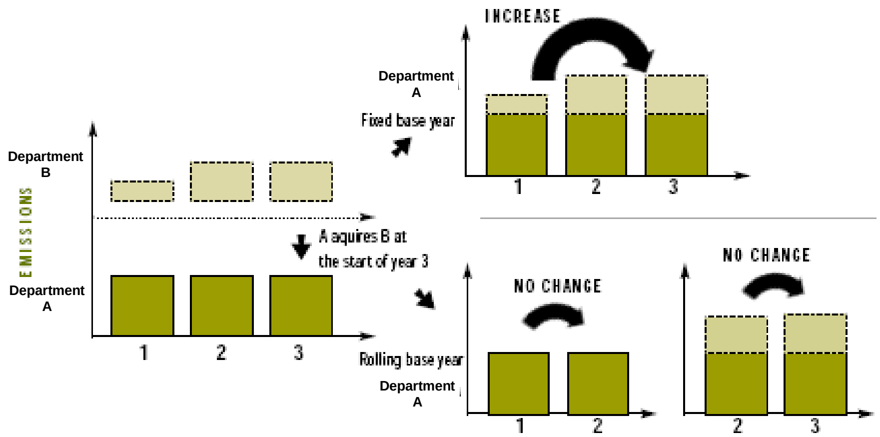
Table 0-2. Comparing Targets with Rolling and Fixed Base Years

➤ Question	➤ Fixed target base year	➤ Rolling target base year
How might the target be stated?	A target might take the form "we will emit X% less in year B than in year A"	A target might take the form of "over the next X years we will reduce emissions every year by Y% compared to the previous year"[a]
What is the target base year?	A fixed reference year in the past	The previous year
How far back is like-with-like comparison possible?	The time series of absolute emissions will compare like with like	If there have been significant structural changes, the time series of absolute emissions will not compare like with like over more than 2 years at a time
What is the basis for comparing emissions between the target base year and completion year? (See Figure 11-2)	The comparison over time is based on what is owned/controlled by the organization in the target completion year	The comparison over time is based on what was owned/controlled by the organization in the years the information was reported[b]
How far back are recalculations made?	Emissions are recalculated for all years back to the fixed target base year	Emissions are recalculated only for the year prior to the structural change, or ex-post for the year of the structural change which then becomes the base year
How reliable are the target base year emissions?	If an organization with a target acquires an agency that did not have reliable GHG data in the target base year; backcasting of emissions becomes necessary, reducing the reliability of the base year	Data from an acquired organization's GHG emissions are only necessary for the year before the acquisition (or even only from the acquisition onwards), reducing or eliminating the need for back-casting
When are recalculations made?	The circumstances which trigger recalculations for structural changes, etc., (see Chapter 5) are the same under both approaches	

[a] Simply adding the yearly emissions changes under the rolling base year yields a different result from the comparison over time made with a fixed base year, even without structural changes. In absolute terms, an X% reduction every year over 5 years (compared with the previous year) is not the same as an (X times 5) reduction in year 5 compared to year 1.

[b] Depending on which recalculation method is used when applying the rolling base year, the comparison over time can include emissions that occurred when the organization did not own or control the emission sources. However, the inclusion of this type of information is minimized. See the guidance document "Base year recalculation methods for structural changes" on the GHG Protocol website (www.ghgprotocol.org).

Figure 0-2. Comparing Stabilization Target under Fixed and Rolling Target Base Year Approach



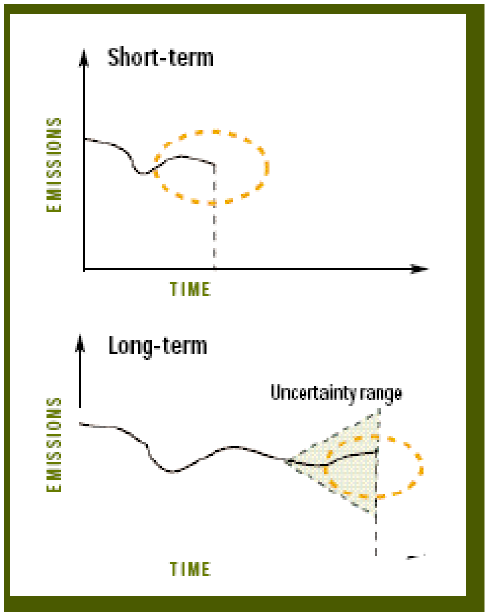
A stabilization target is one that aims to keep emissions constant over time. In this example, department A merges with and subsumes department B, which has experienced organic GHG growth since the target base year (or "starting" year). Under the rolling approach, emissions growth in the subsumed department (B) from year 1 to year 2 does not appear as an emissions increase in relation to the target of the acquiring department (A). Thus department A would meet its stabilization target when using the rolling approach but not when using the fixed approach. In parallel to the example in chapter 5, past GHG growth or decline in divided organizations (GHG changes before the division) would affect the target performance under the rolling approach, while it would not be counted under the fixed approach.

- *Recalculations under intensity targets*. While the standard in Chapter 5 applies to absolute inventory emissions of organizations using intensity targets, recalculations for structural changes for the purposes of the target are not usually needed unless the structural change results in a significant change in the GHG intensity. However, if recalculations for structural changes are made for the purposes of the target, they should be made for both the absolute emissions and the operational metric. If the target operational metric becomes irrelevant through a structural change, a reformulation of the target might be needed (e.g., when an organization refocuses on a different industry but had used an industry-specific operational metric before).

5. Define the Target Completion Date

The target completion date determines whether the target is relatively short or long term. Long-term targets (e.g., with a completion year 10 years from the time the target is set) facilitate long-term planning for large capital investments with GHG benefits. However, they might encourage later phase outs of less efficient equipment. Generally, long-term targets depend on uncertain future developments, which can have opportunities as well as risks, as illustrated in Figure 11-3. A 5-year target period may be more practical for organizations with shorter planning cycles. It is also possible that a target date will be imposed by legislation. Some organizations will be faced with an imposed date or series of dates, with tiered targets.

Figure 0-3. Defining Target Completion Date



6. Define the Length of the Commitment Period

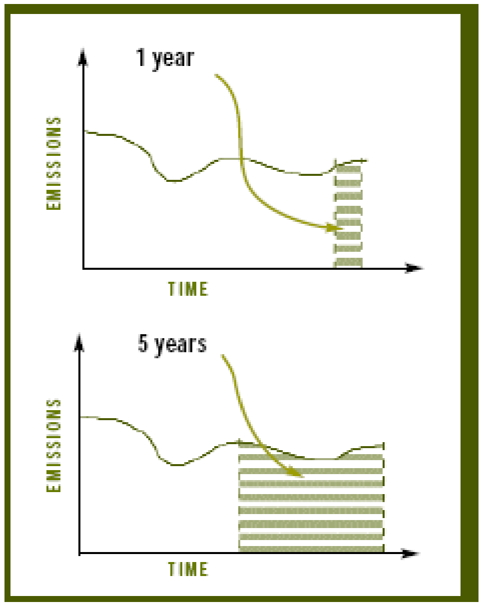
The target commitment period is the time during which emissions performance is actually measured against the target. It ends with the target completion date. Many organizations use single-year commitment periods, whereas the Kyoto Protocol, for example, specifies a multiyear "first commitment period" of 5 years (2008–12). The length of the target commitment period is an important factor in determining an organization's level of commitment. In the public sector, legislation or higher authority can impose target commitment periods. Generally, the longer the target commitment period is, the longer the period during which emissions performance counts towards the target.

- *Example of a single-year commitment period*. Organization Beta has a target of reducing emissions by 10 percent compared with its target base year 2000, by the commitment year 2010. For Beta to meet its target, it is sufficient for its emissions to be, in the year 2010, no more than 90 percent of year 2000 emissions.

- *Example of a multiyear commitment period*. Organization Gamma has a target of reducing emissions by 10 percent, compared with its target base year 2000, by the commitment period 2008–12. For Gamma to meet its target, its sum total emissions from 2008–12 must not exceed 90 percent of year 2000 emissions times five (number of years in the commitment period). In other words, its average emissions over those 5 years must not exceed 90 percent of year 2000 emissions.

Target commitment periods longer than 1 year can be used to mitigate the risk of unpredictable events in one particular year influencing performance against the target. Figure 11-4 shows that the length of the target commitment period determines how many emissions are actually relevant for target performance.

Figure 0-4. Short and Long Commitment Periods



For a target using a rolling base year, the commitment period applies throughout: emission performance is continuously being measured against the target every year from when the target is set until the target completion date.

7. Decide on the Use of GHG Offsets or Credits[5]

A GHG target can be met entirely from internal reductions at sources included in the target boundary or through using offsets generated from GHG reduction projects that reduce emissions at sources (or enhance sinks) external to the target boundary.[6] The use of offsets may be appropriate when the cost of internal reductions is high, opportunities for reductions are limited, or the organization is unable to meet its target because of unexpected circumstances. In the public sector, policy or guidance should be provided to clarify how offsets will be handled and accounted for.

Reporting on the target should specify whether offsets are used and how much of the target reduction was achieved using them.

Credibility of Offsets and Transparency

There are currently no generally accepted methods for quantifying GHG offsets. The uncertainties that surround GHG project accounting make it

[5] As noted in Chapter 8, offsets can be converted to credits. Credits are thus understood to be a subset of offsets. This chapter uses the term offsets as a generic term.

[6] For the purposes of this chapter, the terms "internal" and "external" refer to whether the reductions occur at sources inside (internal) or outside (external) the target boundary.

difficult to establish that an offset is equivalent in magnitude to the internal emissions it is offsetting.[7] This is why organizations should always report their own internal emissions in separate accounts from offsets used to meet the target, rather than providing a net figure (see step 10). It is also important to carefully assess the credibility of offsets used to meet a target and to specify the origin and nature of the offsets when reporting. Information needed includes

- the type of project,
- geographic and organizational origin,
- how offsets have been quantified, and
- whether they have been recognized by external programs [Clean Development Mechanism (CDM), joint implementation (JI), etc.].

One important way to ensure the credibility of offsets is to demonstrate that the quantification method adequately addresses all of the key project accounting challenges in Chapter 8. Taking these challenges into account, the forthcoming quantification standard aims to improve the consistency, credibility, and rigor of project accounting.

The EPA's Climate Leaders Program provides some guidance for using offsets. Consult the program's technical resources for assistance: http://www.epa.gov/climateleaders/resources/index.html.

Additionally, it is important to check that offsets have not also been counted toward another organization's GHG target. This might involve a contract between the buyer and seller that transfers ownership of the offset. Step 8 provides more information on accounting for GHG trades in relation to an organizational target, including establishing a policy on double counting.

Offsets and Intensity Targets

When using offsets under intensity targets, all the above considerations apply. To determine compliance with the target, the offsets can be subtracted from the figure used for absolute emissions (the numerator); the resulting difference is then divided by the corresponding metric. Absolute emissions are still reported separately both from offsets and the operational metric (see step 9 below).

[7] This equivalence is sometimes referred to as "fungibility." Fungibility can also refer to equivalence in terms of the value of reductions in meeting a target; for instance, two fungible offsets have the same value in meeting a target, i.e., they can both be applied to the same target.

8. Establish a Target Double-Counting Policy

This step addresses double counting of GHG reductions and offsets, as well as allowances issued by external trading programs. It applies only to organizations that engage in trading (sale or purchase) of GHG offsets or whose organizational target boundaries interface with other organizations' targets or external programs. This can be particularly relevant for public-sector organizations because many programs can overlap at times.

Given that there is currently no consensus on how such double-counting issues should be addressed, organizations should develop their own "target double-counting policy." This should specify how reductions and trades related to other targets and programs are reconciled with their organization target and, accordingly, which types of double-counting situations are regarded as relevant. The following are some examples of double counting that might need to be addressed in the policy:

- *Double counting of offsets*. This can occur when a GHG offset is counted toward the target by both the selling and purchasing organizations. For example, organization A undertakes an internal reduction project that reduces GHGs at sources included in its own target. Organization A then sells this project reduction to organization B to use as an offset toward its target, while still counting it toward its own target. In this case, reductions are counted by two different organizations against targets that cover different emissions sources. Trading programs address this by using registries that allocate a serial number to all traded offsets or credits and ensuring the serial numbers are retired once they are used. In the absence of registries this could be addressed by a contract between seller and buyer.

- *Double counting due to target overlap*.[8] This can occur when sources included under an organization's target are also subject to limits by an external program or another organization's target. Two examples follow:

  - Organization A has a target that includes GHG sources that are also regulated under a trading program. In this case, reductions at the common sources are used by organization A to meet both its organizational target and the trading program target.

  - Organization B has a target to reduce its direct emissions from the generation of electricity.[9] Organization C who purchases

[8] Overlap here refers to a situation when two or more targets include the same sources in their target boundaries.

[9] Similarly, organization A in this example could be subject to a mandatory cap on its direct emissions under a trading program and engage in trading allowances covering the common sources it shares with organization B. In this case, the example in the section "Double counting of allowances traded in external programs" is more relevant.

electricity directly from organization B also has a target that includes indirect emissions from the purchase of electricity (scope 2). Organization C undertakes energy efficiency measures to reduce its indirect emissions from the use of the electricity. These will usually show up as reductions in both organizations' targets.[10]

These two examples illustrate that double counting is inherent when the GHG sources where the reductions occur are included in more than one target of the same or different organizations. Without limiting the scope of targets, it may be difficult to avoid this type of double counting and it probably does not matter if the double counting is restricted to the organizations sharing the same sources in their targets (i.e., when the two targets overlap).

- *Double counting of allowances traded in external programs*. This occurs when an organizational target overlaps with an external trading program, and allowances that cover the common sources are sold in the trading program for use by another organization and reconciled with the regulatory target, but not reconciled with the organizational target. This example differs from the previous example in that double counting occurs across two targets that are not overlapping (i.e., they do not cover the same sources). This type of double counting could be avoided if the organization selling the allowances reconciles the trade with its target (see Holcim case study). Whatever the organization decides to do in this situation, to maintain credibility, it should address buying and selling of allowances in trading programs in a consistent way. For example, if it decides not to reconcile allowances that it sells in a trading program with its target, it should also not count any allowances of the same type that it purchases to meet its target.

Ideally, an organization should try to avoid double counting in its organizational target if this undermines the environmental integrity of the target. Also, any prevented double counting between two organizations provides an additional incentive for one of these organizations to further reduce emissions. However, in practice, the avoidance of double counting can be quite challenging, particularly for organizations subject to multiple external programs and when indirect GHG emissions are included in the target. Organizations should therefore be transparent about their double-counting policy and state any reasons for choosing not to address some double-counting situations. A national or state registry could help prevent double counting in the future, but would require participation and transparency from all government organizations.

[10] The energy efficiency measures implemented by organization C may not always result in an actual reduction of organization B's emissions. See Chapter 8 for further details on reductions in indirect emissions.

9. Decide on the Target Level

The decision on setting the target level should be informed by all the previous steps. Other considerations to take into account include the following:

- Understanding the key drivers affecting GHG emissions by examining the relationship between GHG emissions and other operational metrics such as productivity, square footage of warehouse space, number of employees, unit of service provided, and budget appropriations.
- Developing different reduction strategies on the basis of the major reduction opportunities available and examining their effects on total GHG emissions. Investigate how emissions projections change with different mitigation strategies.
- Looking at the future of the organization as it relates to GHG emissions.
- Considering whether there are any environmental or energy plans, capital investments, product or service changes, or targets that will affect GHG emissions. Are there plans already in place for fuel switching, on-site power generation, or renewable energy investments that affect the future GHG trajectory?
- Benchmarking GHG emissions with similar organizations. Generally, organizations that have not previously invested in energy and other GHG reductions should be capable of meeting more aggressive reduction levels because they would have more cost-effective reduction opportunities.

10. Track and Report Progress

Once the target has been set, it is necessary to track performance against it to check compliance and—to maintain credibility—to report emissions and any external reductions in a consistent, complete, and transparent manner:

- *Carry out regular performance checks*. To track performance against a target, it is important to link the target to the annual GHG inventory process and make regular checks of emissions in relation to the target. Some organizations use interim targets for this purpose (a target using a rolling target base year automatically includes interim targets every year).
- *Report information in relation to the target*. Organizations should include the following information when setting and reporting progress in relation to a target:

    1. Description of the target

- Provide an outline of the target boundaries chosen.
- Specify target type, target base year, target completion date, and length of commitment period.
- Specify whether offsets can be used to meet the target; if yes, specify the type and amount.
- Describe the target double-counting policy.
- Specify the target level.

2. Information on emissions and performance in relation to the target

- Report emissions from sources inside the target boundary separately from any GHG trades.
- If using an intensity target, report absolute emissions from within the target boundary separately, both from any GHG trades and the operational metric.
- Report GHG trades relevant to compliance with the target (including how many offsets were used to meet the target).
- Report any internal project reductions sold or transferred to another organization for use as an offset.
- Report overall performance in relation to the target.

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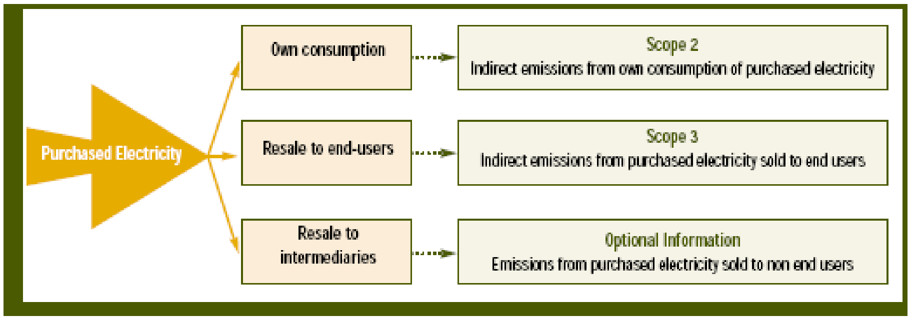
Appendix A
Accounting for Indirect Emissions from Purchased Electricity

This appendix provides guidance on how to account for and report indirect emissions associated with the purchase of electricity. Figure A-1 provides an overview of the transactions associated with purchased electricity and the corresponding emissions.

PURCHASED ELECTRICITY FOR OWN CONSUMPTION

Emissions associated with the generation of purchased electricity that is consumed by the reporting organization are reported in scope 2. Scope 2 only accounts for the portion of the direct emissions from generating electricity that is actually consumed by the organization. An organization that purchases electricity and transports it in a T&D system that it owns or controls reports the emissions associated with T&D losses under scope 2. However, if the reporting organization owns or controls the T&D system but generates (rather than purchases) the electricity transmitted through its wires, the emissions associated with T&D losses are not reported under scope 2, as they would already be accounted for under scope 1. This is the case when generation, transmission, and distribution systems are vertically integrated and owned or controlled by the same organization.

Figure A-1. Accounting for the Indirect GHG Emissions Associated with Purchased Electricity



PURCHASED ELECTRICITY FOR RESALE TO END USERS

Emissions from the generation of purchased electricity for resale to end users, for example purchases by a public utility, may be reported under scope 3 in the category “generation of purchased electricity that is sold to end users.” This reporting category is particularly relevant for utilities that purchase wholesale electricity supplied by independent power producers for resale to their customers. Since utilities and electricity suppliers often exercise choice over where they purchase electricity, this provides them with an important GHG reduction opportunity (see Seattle City Light case study in Chapter 4). Since scope 3 is optional, organizations that are unable to track their electricity sales in terms of end users and non-end users can choose not to report these emissions in scope 3. Instead, they can report the total emissions associated with purchased electricity that is sold to both end users and non-end users under optional information in the category “generation of purchased electricity, heat, or steam for re-sale to non-end users.”

Purchased Electricity for Resale to Intermediaries

Emissions associated with the generation of purchased electricity that is resold to an intermediary (e.g., trading transactions) may be reported under optional information under the category “Generation of purchased electricity, heat, or steam for re-sale to non-end users.” Examples of trading transactions include brokerage/ trading room transactions involving purchased electricity or any other transaction in which electricity is purchased directly from one source or the spot market and then resold to an intermediary (e.g., a non-end user). These emissions are reported under optional information separately from scope 3 because there could be a number of trading transactions before the electricity finally reaches the end user. This may cause duplicative reporting of indirect emissions from a series of electricity trading transactions for the same electricity.

GHG Emissions Upstream of the Generation of Electricity

Emissions associated with the extraction and production of fuels consumed in the generation of purchased electricity may be reported in scope 3 under the category “extraction, production, and transportation of fuels consumed in the generation of electricity.” These emissions occur upstream of the generation of electricity. Examples include emissions from mining of coal, refining of gasoline, extraction of natural gas, and production of hydrogen (if used as a fuel).

Choosing Electricity Emission Factors

To quantify scope 2 emissions, the *Corporate Standard* and this *Public Sector Protocol* recommends that organizations obtain source/supplier specific emission factors for the electricity purchased. If these are not available, regional or grid emission factors should be used. For more information on choosing emission factors, see the relevant GHG Protocol calculation tools available on the GHG Protocol website (www.ghgprotocol.org).

Emissions Associated with the Consumption of Electricity in T&D

Emissions from the generation of electricity that is consumed in a T&D system may be reported in scope 3 under the category "generation of electricity that is consumed in a T&D system" by end users. Published electricity grid emission factors do not usually include T&D losses. To calculate these emissions, it may be necessary to apply supplier or location specific T&D loss factors.

Organizations that purchase electricity and transport it in their own T&D systems would report the portion of electricity consumed in T&D under scope 2.

Accounting for Indirect Emissions Associated with T&D Losses

There are two types of electricity emission factors: emission factor at generation (EFG) and emissions factor at consumption (EFC). EFG is calculated from CO_2 emissions from generation of electricity divided by amount of electricity generated. EFC is calculated from CO_2 emissions from generation divided by amount of electricity consumed.

$$EFG = \frac{\text{Total } CO_2 \text{ Emissions From Generation}}{\text{Electricity Generated}}$$

$$EFC = \frac{\text{Total } CO_2 \text{ Emissions From Generation}}{\text{Electricity Consumed}}$$

EFC and EFG are related as shown below.

$$EFC \times \text{Electricity Consumed} = EFG \times (\text{Electricity Consumed} + \text{T\&D Losses})$$

$$EFC = EFG \times \left(1 + \frac{\text{T\&D Losses}}{\text{Electricity Consumed}}\right)$$

As these equations indicate, EFC multiplied by the amount of consumed electricity yields the sum of emissions attributable to electricity consumed during end use and transmission and distribution. In contrast, EFG multiplied by the amount of consumed electricity yields emissions attributable to electricity consumed during end use only.

Consistent with the scope 2 definition (see Chapter 4), the *Corporate Standard* requires the use of EFG to calculate scope 2 emissions. The use of EFG ensures internal consistency in the treatment of electricity related upstream emissions categories and avoids double counting in scope 2. Additionally, there are several other advantages in using EFG:

- It is simpler to calculate and widely available in published regional, national, and international sources.
- It is based on a commonly used approach to calculate emissions intensity, i.e., emissions per unit of production output.
- It ensures transparency in reporting of indirect emissions from T&D losses.

The formula to account for emissions associated with T&D losses is the following:

EFG × Electricity Consumed during T&D	=	Indirect Emissions from Consumption of Electricity during T&D

In some countries such as Japan, local regulations may require utility organizations to provide both EFG and EFC to its consumers, and consumers may be required to use EFC to calculate indirect emissions from the consumption of purchased electricity. In this case, an organization still needs to use EFG to report its scope 2 emissions for a GHG report prepared in accordance with *Corporate Standard* and this *Public Sector Protocol*.

Appendix B
Accounting for Sequestered Atmospheric Carbon

A key purpose of the *Corporate Standard* and this *Public Sector Protocol* is to provide organizations with guidance on how to develop inventories that provide an accurate and complete picture of their GHG emissions both from their direct operations as well as those along the value chain.[1] For some types of organizations, this is not possible without addressing the organization's impacts on sequestered atmospheric carbon.[2]

Sequestered Atmospheric Carbon

During photosynthesis, plants remove carbon (as CO_2) from the atmosphere and store it in plant tissue. Until this carbon is cycled back into the atmosphere, it resides in one of a number of "carbon pools." These pools include (a) above ground biomass (e.g., vegetation) in forests, farmland, and other terrestrial environments, (b) below ground biomass (e.g., roots), and (c) biomass-based products (e.g., wood products) both while in use and when stored in a landfill.

Carbon can remain in some of these pools for long periods of time, sometimes for centuries. An increase in the stock of sequestered carbon stored in these pools represents a net removal of carbon from the atmosphere; a decrease in the stock represents a net addition of carbon to the atmosphere. In general, carbon sequestration in plants is recognized as an opportunity for organizations to offset GHG emissions, but it should be noted that intact plants may also represent a liability in that certain unplanned events such as fires can unexpectedly release GHGs into the atmosphere.

Why Include Impacts on Sequestered Carbon in Organizational GHG Inventories?

It is generally recognized that changes in stocks of sequestered carbon and the associated exchanges of carbon with the atmosphere are important to national

[1] In this appendix, "value chain" means a series of operations and entities, starting with the forest and extending through end-of-life management, that (a) supply or add value to raw materials and intermediate products to produce final products for the marketplace and (b) are involved in the use and end-of-life management of these products.

[2] In this appendix, the term "sequestered atmospheric carbon" refers exclusively to sequestration by biological sinks.

level GHG emissions inventories, and consequently, these impacts on sequestered carbon are commonly addressed in national inventories [United Nations Framework Convention on Climate Change (UNFCCC), 2000]. Similarly, for organizations managing large stocks of biomass, such as the forest products industry and parks agencies, some of the most significant aspects of an organization's overall impact on atmospheric CO_2 levels will occur as a result of impacts on sequestered carbon in their direct operations as well as along their value chain. Some forest product companies have begun to address this aspect of their GHG footprint within their corporate GHG inventories (Georgia Pacific, 2002). Moreover, the GHG Protocol has developed *The Land Use, Land-Use Change, and Forestry Guidance for GHG Project Accounting* and WBCSD has produced *The Sustainable Forest Products Industry, Carbon and Climate Change* to address some carbon measurement, accounting, reporting, and ownership issues associated with GHG reduction projects and the forest products value chain. These efforts for the private sector will help to inform related public sector activities. Information on an organization's impacts on sequestered atmospheric carbon can be used for strategic planning, for educating stakeholders, and for identifying opportunities for improving the organization's GHG profile. Opportunities may also exist to create value from reductions created along the value chain by organizations acting alone or in partnership with private companies, constituents, or the public.

Accounting For Sequestered Carbon in the Context of the *GHG Protocol Corporate Standard*

Consensus methods have yet to be developed under the *GHG Protocol Corporate Standard* for accounting of sequestered atmospheric carbon as it moves through the entire value chain of biomass-based industries. Nonetheless, some issues that would need to be addressed when addressing impacts on sequestered carbon in organizations' inventories can be examined in the context of existing guidance provided by the *GHG Protocol Corporate Standard* as highlighted below.

Setting Organizational Boundaries

The *GHG Protocol Corporate Standard* outlines two approaches for consolidating GHG data—the equity share approach and the control approach. In some cases, it may be possible to apply these approaches directly to emissions/removals associated with sequestered atmospheric carbon. Among the issues that may need to be examined is the ownership of sequestered carbon under the different types of contractual arrangements involving land and wood ownership, harvesting rights, and control of land management and harvesting decisions. This is particularly important when logging rights for timber on publically owned lands are involved; where disparate accounting practices are used by the parties involved, explicit contractual agreements may be required to clarify the transfer of ownership as carbon moves through the value chain. In some cases, as part of a risk management program for instance, organizations may be interested in performing value chain assessments of sequestered carbon without regard to ownership or control just as they might do for scope 2 and 3 emissions.

Setting Operational Boundaries

As with GHG emissions accounting, setting operational boundaries for sequestered carbon inventories would help organizations transparently report their impacts on sequestered carbon along their value chain. Organizations may, for example, provide a description of the value chain capturing impacts that are material to the results of the analysis. This should include which pools are included in the analysis, which are not, and the rationale for the selections. Until consensus methods are developed for characterizing impacts on sequestered atmospheric carbon along the value chain, this information can be included in the "optional information" section of a GHG inventory compiled using the *Public Sector Protocol.*

Tracking Removals Over Time

As is sometimes the case with accounting for GHG emissions, base-year data for impacts on sequestered carbon may need to be averaged over multiple years to accommodate the year-to-year variability expected of these systems. The temporal scale used in sequestered carbon accounting will often be closely tied to the spatial scale over which the accounting is done. The question of how to recalculate base years to account for land acquisition and divestment, land use changes, and other activities also needs to be addressed.

Identifying and Calculating GHG Removals

The *Public Sector Protocol* does not include consensus methods for sequestered carbon quantification. Organizations should, therefore, explain the methods used. In some instances, quantification methods used in national inventories can be adapted for organization-level quantification of sequestered carbon. IPCC (1997; 2000b) provides useful information on how to do this. IPCC has issued *Good Practice Guidance for Land Use, Land Use Change and Forestry*, with information on methods for quantification of sequestered carbon in forests and forest products. Organizations may also find it useful to consult the methods used to prepare national inventories for those countries where significant parts of their organization's value chain reside.

In addition, although organizational inventory accounting differs from project-based accounting (as discussed below), it may be possible to use some of the calculation and monitoring methods derived from project level accounting of sequestration projects.

Accounting for Removal Enhancements

An organizational inventory can be used to account for yearly removals within the organizational boundary. In contrast, the *GHG Protocol Project Quantification Standard* is designed to calculate project reductions that will be used as offsets, relative to a hypothetical baseline scenario for what would have happened without the project. In the forestry sector, projects take the form of removal enhancements.

Chapter 8 in this document addresses some of the issues that must be addressed when accounting for offsets from GHG reduction projects. Much of this guidance is also applicable to removal enhancement projects. One example is the issue of reversibility of removals—also briefly described in chapter 8.

Reporting GHG Removals

Until consensus methods are developed for characterizing impacts on sequestered atmospheric carbon along the value chain, this information can be included in the "optional information" section of the inventory (See chapter 9). Information on sequestered carbon in the organization's inventory boundary should be kept separate from project-based reductions at sources that are not in the inventory boundary. Where removal enhancement projects take place within an organization's inventory boundary they would normally show up as an increase in carbon removals over time, but can also be reported in optional information. However, they should also be identified separately to ensure that they are not double counted. This is especially important when they are sold as offsets or credits to a third party.

As organizations develop experience using various methods for characterizing impacts on sequestered carbon, more information will become available on the level of accuracy to expect from these methods. In the early stages of developing this experience, however, organizations may find it difficult to assess the uncertainty associated with the estimates and therefore may need to give special care to how the estimates are represented to stakeholders.

Appendix C
Overview of GHG Programs

Name of program	Type of program	Focus (organization, project, facility)	Gases covered	Organizational project boundaries	Operational boundaries	Nature/purpose of program	Base year	Target	Verification
California Climate Action Registry www.climateregisty.org	Voluntary registry	Organization (Projects possible in 2004)	Organizations report CO_2 for first 3 years of participation, all six GHGs thereafter.	Equity share or control for California or United States operations	Scope 1 and 2 required, scope 3 to be decided	Baseline protection, public reporting, possible future targets	Specific to each organization, recalculation consistent with *GHG Protocol Corporate Standard* required	Encouraged but optional	Required through certified third party verifier
U.S. EPA Climate Leaders www.epa.gov/climateleaders	Voluntary reduction program	Organization	Six	Equity share or control for US operations at a minimum	Scope 1 and 2 required, scope 3 optional	Public recognition, assistance setting targets and achieving reductions	Year that organization joins program, recalculation consistent with *GHG Protocol Corporate Standard* required	Required, specific to each organization	Optional, provides guidance and checklist of components that should be included if undertaken
World Wildlife Fund Climate Savers www.worldwildlife.org/climatesavers	Voluntary registry	Organization	CO_2	Equity share or control for worldwide operations	Scope 1 and 2 required, scope 3 optional	Achieve targets, public recognition, expert assistance	Chosen year since 1990, specific to each organization, recalculation consistent with *GHG Protocol Corporate Standard* required	Required, specific to each organization	Third party verifier
World Economic Forum Global GHG Register www.weforum.org	Voluntary registry	Organization	Six	Equity share or control for worldwide operations	Scope 1 and 2 required, scope 3 optional	Baseline protection, public reporting, targets encouraged but optional	Chosen year since 1990, specific to each organization, recalculation consistent with *GHG Protocol Corporate Standard* required	Encouraged but optional	Third party verifier or spot checks by the World Economic Forum
European GHG Emissions Allowance Trading Scheme http://ec.europa.eu/environment/index_en.htm	Mandatory allowance trading scheme	Facility	Six	Facilities in selected sectors	Scope 1	Achieve annual caps through tradable allowance market, initial period from 2005 to 2007	Determined by member country for allowance allocation	Annual compliance with allocated and traded allowances, European committed to 8% overall reduction below 1990	Third party verifier
European Pollutant Emission Registry www.europa.eu.int/comm/environment/ippc/eper/index.htm	Mandatory registry for large industrial facilities	Facility	Six Kyoto gases as well as other pollutants	Facilities that fall under European Intergovernmental Panel on Climate Change directive	Scope 1 required	Permit individual industrial facilities	Not applicable	Not applicable	Local permitting authority
Chicago Climate Exchange www.chicagoclimateexchange.com	Voluntary allowance trading scheme	Organization and project	Six	Equity share	Direct combustion and process emission sources and indirect emissions optional.	Achieve annual targets through tradable allowance market	Average of 1998 through 2001	1% below its baseline in 2003, 2% below baseline in 2004, 3% below baseline in 2005 and 4% below baseline in 2006	Third party verifier
Respect Europe Business Leaders Initiative on Climate Change http://www.respecteurope.com/start.aspx	Voluntary reduction program	Organization	Six	Equity share or control for worldwide operations	Scope 1 and 2 required, scope 3 strongly encouraged	Achieve targets, public recognition, expert assistance	Specific to each organization, recalculation consistent with *GHG Protocol Corporate Standard* required	Mandatory, specific to each organization	Third party verifier
Energy Information Administration 1605B www.eia.doe.gov/oiaf/1605/1605b.html	Voluntary reporting program	Organization and project	Organizations have the option of reporting six Kyoto gases plus others	Equity share or control for worldwide operations	Scope 1 required, scope 2 and 3 optional	Public recognition, assistance measuring and recording reductions	Recommended 1987 to 1990	Required, specific to each organization or project	None required
International Council for Local Environmental Initiatives Cities for Climate Protection Program http://www.iclei.org/	Voluntary reduction program	Organization	Six	Control for local government or geographic operations	Scope 1 and 2 required, scope 3 optional	Assistance setting targets and achieving reductions for local governments	Required, specific to each local government	Required, specific to each local government	None required

Appendix D

Industry Sectors and Scopes

Sector	Scope 1 emission sources	Scope 2 emission sources	Scope 3 emission sources[a]
Energy			
Energy Generation	◆ Stationary combustion (boilers and turbines used in the production of electricity, heat or steam, fuel pumps, fuel cells, flaring) ◆ Mobile combustion (trucks, barges and trains for transportation of fuels) ◆ Fugitive emissions (CH_4 leakage from transmission and storage facilities, HFC emissions from Liquid Propane Gas (LPG) storage facilities, SF_6 emissions from transmission and distribution equipment)	◆ Stationary combustion (consumption of purchased electricity, heat or steam)	◆ Stationary combustion (mining and extraction of fuels, energy for refining or processing fuels) ◆ Process emissions (production of fuels, SF_6 emissions[b]) ◆ Mobile combustion (transportation of fuels/ waste, employee business travel, employee commuting) ◆ Fugitive emissions (CH_4 and CO_2 from waste landfills, pipelines, SF_6 emissions)
Oil and Gas[c]	◆ Stationary combustion (process heaters, engines, turbines, flares, incinerators, oxidizers, production of electricity, heat and steam) ◆ Process emissions (process vents, equipment vents, maintenance/ turnaround activities, non-routine activities) ◆ Mobile combustion (transportation of raw materials/ products/waste; company owned vehicles) ◆ Fugitive emissions (leaks from pressurized equipment, wastewater treatment, surface impoundments)	◆ Stationary combustion (consumption of purchased electricity, heat or steam)	◆ Stationary combustion (product use as fuel or combustion for the production of purchased materials) ◆ Mobile combustion (transportation of raw materials/products/waste, employee business travel, employee commuting, product use as fuel) ◆ Process emissions (product use as feedstock or emissions from the production of purchased materials) ◆ Fugitive emissions (CH_4 and CO_2 from waste landfills or from the production of purchased materials)

Sector	Scope 1 emission sources	Scope 2 emission sources	Scope 3 emission sources[a]
Coal Mining	◆ Stationary combustion (methane flaring and use, use of explosives, mine fires) ◆ Mobile combustion (mining equipment, transportation of coal) ◆ Fugitive emissions (CH_4 emissions from coal mines and coal piles)	◆ Stationary combustion (consumption of purchased electricity, heat or steam)	◆ Stationary combustion (product use as fuel) ◆ Mobile combustion (transportation of coal/waste, employee business travel, employee commuting) ◆ Process emissions (gasification)
Metals			
Aluminum[d]	◆ Stationary combustion (bauxite to aluminum processing, coke baking, lime, soda ash and fuel use, on-site CHP) ◆ Process emissions (carbon anode oxidation, electrolysis, PFC) ◆ Mobile combustion (pre- and post-smelting transportation, ore haulers) ◆ Fugitive emissions (fuel line CH_4, HFC and PFC, SF_6 cover gas)	◆ Stationary combustion (consumption of purchased electricity, heat or steam)	◆ Stationary combustion (raw material processing and coke production by second party suppliers, manufacture of production line machinery) ◆ Mobile combustion (transportation services, business travel, employee commuting) ◆ Process emissions (during production of purchased materials) ◆ Fugitive emissions (mining and landfill CH_4 and CO_2, outsourced process emissions)
Iron and Steel[e]	◆ Stationary combustion (coke, coal and carbonate fluxes, boilers, flares) ◆ Process emissions (crude iron oxidation, consumption of reducing agent, carbon content of crude iron/ferroalloys) ◆ Mobile combustion (on-site transportation) ◆ Fugitive emission (CH_4, N_2O)	◆ Stationary combustion (consumption of purchased electricity, heat or steam)	◆ Stationary combustion (mining equipment, production of purchased materials) ◆ Process emissions (production of ferroalloys) ◆ Mobile combustion (transportation of raw materials/products/waste and intermediate products) ◆ Fugitive emissions (CH_4 and CO_2 from waste landfills)

Sector	Scope 1 emission sources	Scope 2 emission sources	Scope 3 emission sources[a]
Chemicals			
Nitric acid, Ammonia, Adipic acid, Urea, and Petrochemicals	◆ Stationary combustion (boilers, flaring, reductive furnaces, flame reactors, steam reformers) ◆ Process emissions (oxidation/reduction of substrates, impurity removal, N_2O byproducts, catalytic cracking, myriad other emissions individual to each process) ◆ Mobile combustion (transportation of raw materials/ products/waste) ◆ Fugitive emissions (HFC use, storage tank leakage)	◆ Stationary combustion (consumption of purchased electricity, heat or steam)	◆ Stationary combustion (production of purchased materials, waste combustion) ◆ Process emissions (production of purchased materials) ◆ Mobile combustion (transportation of raw materials/products/waste, employee business travel, employee commuting) ◆ Fugitive emissions (CH_4 and CO_2 from waste landfills and pipelines)
Cement and Lime[f]	◆ Process emissions (calcination of limestone) ◆ Stationary combustion (clinker kiln, drying of raw materials, production of electricity) ◆ Mobile combustion (quarry operations, on-site transportation)	◆ Stationary combustion (consumption of purchased electricity, heat or steam)	◆ Stationary combustion (production of purchased materials, waste combustion) ◆ Process emissions (production of purchased clinker and lime) ◆ Mobile combustion (transportation of raw materials/products/waste, employee business travel, employee commuting) ◆ Fugitive emissions (mining and landfill CH_4 and CO_2, outsourced process emissions)
Waste[g]			
Landfills, Waste Combustion, Water Services	◆ Stationary combustion (incinerators, boilers, flaring) ◆ Process emissions (sewage treatment, nitrogen loading) ◆ Fugitive emissions (CH_4 and CO_2 emissions from waste and animal product decomposition) ◆ Mobile combustion (transportation of waste/ products)	◆ Stationary combustion (consumption of purchased electricity, heat or steam)	◆ Stationary combustion(recycled waste used as a fuel) ◆ Process emissions (recycled waste used as a feedstock) ◆ Mobile combustion (transportation of waste/products, employee business travel, employee commuting)

Sector	Scope 1 emission sources	Scope 2 emission sources	Scope 3 emission sources[a]
Pulp & Paper			
Pulp and Paper[h]	◆ Stationary combustion (production of steam and electricity, fossil fuel-derived emissions from calcination of calcium carbonate in lime kilns, drying products with infrared driers fired with fossil fuels) ◆ Mobile combustion (transportation of raw materials, products, and wastes, operation of harvesting equipment) ◆ Fugitive emissions (CH_4 and CO_2 from waste)	◆ Stationary combustion (consumption of purchased electricity, heat or steam)	◆ Stationary combustion (production of purchased materials, waste combustion) ◆ Process emissions (production of purchased materials) ◆ Mobile combustion (transportation of raw materials/products/waste, employee business travel, employee commuting) ◆ Fugitive emissions (landfill CH_4 and CO_2 emissions)
HFC, PFC, SF_6, and HCFC 22 Production[i]			
HCFC 22 production	◆ Stationary combustion (production of electricity, heat or steam) ◆ Process emissions (HFC venting) ◆ Mobile combustion (transportation of raw materials/products/waste) ◆ Fugitive emissions (HFC use)	◆ Stationary combustion (consumption of purchased electricity, heat or steam)	◆ Stationary combustion (production of purchased materials) ◆ Process emissions (production of purchased materials) ◆ Mobile combustion (transportation of raw materials/products/waste, employee business travel, employee commuting) ◆ Fugitive emissions (fugitive leaks in product use, CH_4 and CO_2 from waste landfills)

Sector	Scope 1 emission sources	Scope 2 emission sources	Scope 3 emission sources[a]
Semiconductor Production			
Semiconductor Production	◆ Process emissions (C_2F_6, CH_4, CHF_3, SF_6, NF_3, C_3F_8, C_4F_8, N_2O used in wafer fabrication, CF_4 created from C_2F_6 and C_3F_8 processing) ◆ Stationary combustion (oxidation of volatile organic waste, production of electricity, heat or steam) ◆ Fugitive emissions (process gas storage leaks, container remainders/heel leakage) ◆ Mobile combustion (transportation of raw materials/ products/waste)	◆ Stationary combustion (consumption of purchased electricity, heat or steam)	◆ Stationary combustion (production of imported materials, waste combustion, upstream T&D losses of purchased electricity) ◆ Process emissions (production of purchased materials, outsourced disposal of returned process gases and container remainder/heel) ◆ Mobile combustion (transportation of raw materials/products/waste, employee business travel, employee commuting) ◆ Fugitive emissions (landfill CH_4 and CO_2 emissions, downstream process gas container remainder/heel leakage
Other Sectors[j]			
Service Sector/ Office-based Organizations[k]	◆ Stationary combustion (production of electricity, heat or steam) ◆ Mobile combustion (transportation of raw materials/ waste) ◆ Fugitive emissions (mainly HFC emissions during use of refrigeration and air-conditioning equipment)	◆ Stationary combustion (consumption of purchased electricity, heat or steam)	◆ Stationary combustion (production of purchased materials) ◆ Process emissions (production of purchased materials) ◆ Mobile combustion (transportation of raw materials/products/waste, employee business travel, employee commuting)

[a] Scope 3 activities of outsourcing, contract manufacturing, and franchises are not addressed in this table because the inclusion of specific GHG sources will depend on the nature of the outsourcing.

[b] Guidelines on unintentional SF_6 process emissions are to be developed.

[c] The American Petroleum Institute's Compendium of Greenhouse Gas Emissions Methodologies for the Oil and Gas Industry (2004) provides guidelines and calculation methodology for calculating GHG emissions from the oil and gas sector.

[d] The International Aluminum Institute's Aluminum Sector Greenhouse Gas Protocol (2003), in cooperation with WRI and WBCSD, provides guidelines and tools for calculating GHG emissions from the aluminum sector.

[e] The International Iron and Steel Institute's Iron and Steel sector guidelines, in cooperation with WRI and WBCSD, are under development.

[f] The WBCSD Working Group Cement: Toward a Sustainable Cement Industry has developed The Cement CO_2 Protocol: CO_2 Emissions Monitoring and Reporting Protocol for the Cement Industry (2002), which includes guidelines and tools to calculate GHG emissions from the cement sector.

[g] Guidelines for waste sector are to be developed.

[h] The Climate Change Working Group of the International Council of Forest and Paper Associations has developed Calculation Tools for Estimating Greenhouse Gas Emissions from Pulp and Paper Mills (2002), which includes guidelines and tools to calculate GHG emissions from the pulp and paper sector.

[i] Guidelines for PFC and SF_6 production are to be developed.

[j] Businesses in “other sectors” can estimate GHG emissions using cross-sectoral estimation tools—stationary combustion, mobile (transportation) combustion, HFC use, measurement and estimation uncertainty, and waste.

[k] WRI has developed Working 9 to 5 on Climate Change: An Office Guide (2002) and www.Safeclimate.net, which include guidelines and calculation tools for calculating GHG emissions from office-based organizations.

Appendix E

Categorizing GHG Emissions Associated with Leased Assets

INTRODUCTION

Many organizations encounter leasing situations, both as a lessee and lessor of building space, vehicles, or equipment as part of their operations, and must decide how to account for and report GHG emissions associated with these assets. To do so, you must first know the type of lease established by your organization and the organizational boundary approach selected for creating the inventory (i.e., equity share, financial control, or operational control).

The following leasing guidance should be used to determine:

- Whether emissions that would normally be categorized as scope 1 (direct) in a non-leasing situation should be categorized as scope 1 (direct) or scope 3 (indirect)[1] in a leasing situation.
- Whether emissions that would normally be categorized as scope 2 (indirect) in a non-leasing situation should be categorized as scope 2 (indirect) or scope 3 (indirect) in a leasing situation.

Emissions that are categorized as scope 3 (indirect) in non-leasing situations, such as upstream and downstream emissions, would also be categorized as scope 3 (indirect) emissions in leasing situations and so are not discussed further in this appendix.

This guidance has been designed to ensure that the categorization of emissions from leased assets by lessors and lessees does not lead to double counting of emissions in scopes 1 and 2.

DIFFERENTIATING TYPES OF LEASED ASSETS

The first step in determining how to categorize emissions from leased assets is to understand the two different types of leases: capital leases and operating leases.

[1] Organizations that have power-generating facilities and would normally categorize the facilities' emissions as scope 1 (direct) in a non-leasing situation must determine whether these emissions would be scope 2 (indirect) or scope 3 (indirect) in a leasing situation. For more guidance, refer to the calculation tool on the GHG Protocol's website, www.ghgprotocol.org, which deals with indirect emissions from electricity.

- *Capital lease*. This type of lease, often referred to as a finance lease in the private sector, enables the lessee to operate an asset and also gives the lessee all the risks and rewards of owning the asset. Assets leased under a capital lease are considered wholly owned assets in financial accounting and are recorded as such on the balance sheet.

- *Operating lease*. This type of lease enables the lessee to operate an asset, like a building or vehicle, but does not give the lessee any of the risks or rewards of owning the asset. Any lease that is not a capital lease is an operating lease.[2]

One way to determine whether an asset is leased under an operating or capital lease is to check the company's audited financial statements.

CATEGORIZING EMISSIONS FROM LEASED ASSETS (LESSEE'S PERSPECTIVE)

Next you must determine whether the emissions associated with the leased assets should be categorized as direct (scope 1) emissions or indirect (scope 2 or 3) emissions in your organization's operational boundary.

- *Capital lease*. Under a capital lease, the lessee is considered to have ownership and both financial and operational control of the leased asset. Therefore, emissions associated with fuel combustion[3] should be categorized as scope 1 (direct), and emissions associated with use of purchased electricity should be categorized as scope 2 (indirect), regardless of the organizational boundary approach selected (see Table E-1).

- *Operating lease*. Under an operating lease, the lessee is considered not to have ownership or financial control but to have operational control of the leased asset. Therefore, the categorization of emissions as direct or indirect depends on the organizational boundary approach selected. If the lessee uses the equity share or a financial control approach, the emissions associated with fuel combustion as well as with the use of purchased electricity should always be categorized as scope 3 (indirect). But if the lessee uses the operational control approach, emissions associated with fuel combustion should be categorized as scope 1 (direct), and emissions

[2] Financial Accounting Standards Board, Statement of Financial Accounting Standards, no. 13, "Accounting for Leases" (1976).

[3] For this discussion, we assume that most emissions that could be categorized as direct emissions are associated with fuel combustion. However, organizations may also have other sources of emissions, such as emissions from industrial processes or HFC emissions from refrigeration and air conditioning, which could also be categorized as direct emissions. For these other potential sources of direct emissions, companies should follow the leasing guidance described for fuel combustion. We have focused on fuel combustion in this appendix for simplicity in explaining the leasing guidance.

associated with the use of purchased electricity should be categorized as scope 2 (indirect) (see Table E-1).

If these guidelines for categorizing emissions from leased assets have been correctly applied, indirect emissions from the use of purchased electricity may sometimes be categorized as scope 3 instead of scope 2. This is the case when a leased building is held under an operating lease and the organizational boundary approach used is either equity share or financial control.

Table E-1. Emissions from Leased Assets: Leasing Agreements and Boundaries (Lessee's Perspective)

	Type of leasing arrangement	
	Capital lease	Operating lease
Equity Share or Financial Control Approach Used	Lessee does have ownership and financial control, therefore emissions associated with fuel combustion are scope 1 and with use of purchased electricity are scope 2.	Lessee does not have ownership or financial control, therefore emissions associated with fuel combustion are scope 3 and with use of purchased electricity are scope 3.
Operational Control Approach Used	Lessee does have operational control, therefore emissions associated with fuel combustion are scope 1 and with use of purchased electricity are scope 2.	Lessee does have operational control, therefore emissions associated with fuel combustion are scope 1 and with use of purchased electricity are scope 2.[a]

[a] Some organizations may be able to demonstrate that they do not have operational control over a leased asset held under an operating lease. In these cases, the organization may report emissions from the leased asset as scope 3 but must state clearly in its GHG inventory report the reason(s) why they do not have operational control.

CATEGORIZING EMISSIONS FROM LEASED ASSETS (LESSOR'S PERSPECTIVE)

Some organizations may lease assets to other public or private sector entities; for example, the General Services Administration may lease office or retail space, or vehicles to other federal agencies or private companies. Whether emissions from these assets should be categorized by the lessor as direct (scope 1) or indirect (scope 2 or 3) depends on the organizational boundary approach and the type of leasing arrangement. In the case of capital leases, ownership and financial and operational control is transferred to the lessee, while operational control is granted to the lessee through an operating lease.

- *Capital lease*. The lessor does not have ownership or financial or operational control of these assets. Therefore, the associated emissions always are scope 3 (indirect) for the lessor, regardless of the type of organizational boundary approach used (see Table E-2).

- *Operating lease*. The lessor has ownership and financial control of these assets but not operational control. Therefore, if the equity share or a financial control approach is used, the emissions associated with fuel combustion should be categorized as scope 1 (direct), and the emissions associated with the use of purchased electricity should be categorized as scope 2 (indirect) for the lessor. However, if the operational control approach is used, emissions from fuel combustion and the use of purchased electricity will always be scope 3 (indirect) for the lessor (see Table E-2).

Table E-2. Emissions from Leased Assets: Leasing Agreements and Boundaries (Lessor's Perspective)

	Type of leasing arrangement	
	Capital lease	Operating lease
Equity Share or Financial Control Approach Used	Lessor does not have ownership or financial control, therefore emissions associated with fuel combustion are scope 3 and with use of purchased electricity are scope 3.	Lessor does have ownership and financial control, therefore emissions associated with fuel combustion are scope 1 and with use of purchased electricity are scope 2.
Operational Control Approach Used	Lessor does not have operational control, therefore emissions associated with fuel combustion are scope 3 and with use of purchased electricity are scope 3.	Lessor does not have operational control, therefore emissions associated with fuel combustion are scope 3 and with use of purchased electricity are scope 3.[a]

[a] Some organizations may be able to demonstrate that they do have operational control over an asset leased to another organization under an operating lease, especially when operational control is not perceived by the lessee. In this case, the lessor may report emissions from fuel combustion as scope 1 and emissions from the use of purchased electricity as scope 2. The lessor must clearly state in the GHG inventory report why they do not have operational control.

Proper categorization of emissions from leased assets by lessors and lessees ensures that emissions in scopes 1 and 2 are not double counted. For example, if a lessee categorizes emissions from the use of purchased electricity as scope 2, the lessor should categorize the same emissions as scope 3, and vice versa.

Appendix F
Abbreviations

A/C	air conditioning
$CaCO_3$	calcium carbonate
CAP	criteria air pollutant
CCAR	California Climate Action Registry
CCX	Chicago Climate Exchange
CDM	clean development mechanism
CEM	continuous emission monitoring
CFCs	chlorofluorocarbons
CFP	Climate Friendly Parks
CH_4	methane
CHP	combined heat and power
CLIP	Climate Leadership In Parks
CO_2	carbon dioxide
CO_2-eq	carbon dioxide equivalent
COCO	contractor owned/contractor operated
CRS	Congressional Research Service
DoD	Department of Defense
DOE	Department of Energy
EFC	emissions factor at consumption
EFG	emission factor at generation
EO	executive order
EPA	Environmental Protection Agency
ERU	emission reduction unit
EU ETS	European Union Emissions Allowance Trading Scheme
GHG	greenhouse gas
GRI	Global Reporting Initiative
GWP	global warming potential

HCFC	hydrochlorofluorocarbons
HFCs	hydrofluorocarbons
HVAC	heating, ventilation, and air conditioning
IMP	inventory management plan
IPCC	Intergovernmental Panel on Climate Change
JI	joint implementation
MMT	million metric tons
MWh	megawatts per hour
N_2O	nitrous oxide
NASA	National Aeronautics and Space Administration
NASA-JSC	National Aeronautics and Space Administration – Johnson Space Center
NGO	non-governmental organization
NO_x	nitrogen oxide
NPS	National Park Service
PFCs	perfluorocarbons
PwC	PricewaterhouseCoopers
REC	renewable energy certificate
RGGI	Regional Greenhouse Gas Initiative
SCL	Seattle City Light
SF_6	sulfur hexafluoride
T&D	transmission and distribution
UK ETS	United Kingdom Emission Trading Scheme
UNFCC	United Nations Framework Convention on Climate Change
UTC	United Technologies Corporation
WBCSD	World Business Council for Sustainable Development
WRI	World Resources Institute

Appendix G
Glossary

Absolute target. A target defined by reduction in absolute emissions over time e.g., reduces CO_2 emissions by 25 percent below 1994 levels by 2010.

Additionality. A criterion for assessing whether a project has resulted in GHG emission reductions or removals in addition to what would have occurred in its absence. This is an important criterion when the goal of the project is to offset emissions elsewhere.

Allowance. A commodity giving its holder the right to emit a certain quantity of GHG. Annex 1 countries defined in the International Climate Change Convention as those countries taking on emissions reduction obligations: Australia, Austria, Belgium, Belarus, Bulgaria, Canada, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Latvia, Liechtenstein, Lithuania, Luxembourg, Monaco, Netherlands, New Zealand, Norway, Poland, Portugal, Romania, Russian Federation, Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine, United Kingdom, and United States of America.

Associated/affiliated company. The parent company has significant influence over the operating and financial policies of the associated/affiliated company, but not financial control.

Audit trail. Well organized and transparent historical records documenting how an inventory was compiled.

Baseline. A hypothetical scenario for what GHG emissions, removals, or storage would have been in the absence of the GHG project or project activity.

Base year. A historic datum (a specific year or an average over multiple years) against which a company's emissions are tracked over time.

Base year emissions. GHG emissions in the base year.

Base year emissions recalculation. Recalculation of emissions in the base year to reflect a change in the structure of the company, or to reflect a change in the accounting methodology used. This ensures data consistency over time, i.e., comparisons of like with like over time.

Biofuels. Fuel made from plant material, e.g. wood, straw, and ethanol from plant matter.

Boundaries. GHG accounting and reporting boundaries can have several dimensions, i.e. organizational, operational, geographic, business unit, and target boundaries. The inventory boundary determines which emissions are accounted and reported by the company.

Cap and trade system. A system that sets an overall emissions limit, allocates emissions allowances to participants, and allows them to trade allowances and emission credits with each other.

Capital lease. A lease which transfers substantially all the risks and rewards of ownership to the lessee and is accounted for as an asset on the balance sheet of the lessee. Also known as a financial or finance lease. Leases other than capital/financial/finance leases are operating leases. Consult an accountant for further detail as definitions of lease types differ between various accepted financial standards.

Carbon sequestration. The uptake of CO_2 and storage of carbon in biological sinks.

Clean development mechanism. A mechanism established by Article 12 of the Kyoto Protocol for project-based emission reduction activities in developing countries. The CDM is designed to meet two main objectives: to address the sustainability needs of the host country and to increase the opportunities available to Annex 1 Parties to meet their GHG reduction commitments. The CDM allows for the creation, acquisition, and transfer of CERs from climate change mitigation projects undertaken in non-Annex 1 countries.

Certified emission reductions. A unit of emission reduction generated by a CDM project. CERs are tradable commodities that can be used by Annex 1 countries to meet their commitments under the Kyoto Protocol.

Co-generation unit/combined heat and power. A facility producing both electricity and steam/heat using the same fuel supply.

Consolidation. Combination of GHG emissions data from separate operations that form part of one company or group of companies.

Control. The ability of a company to direct the policies of another operation. More specifically, it is defined as either operational control (the organization or one of its subsidiaries has the full authority to introduce and implement its operating policies at the operation) or financial control (the organization has the ability to direct the financial and operating policies of the operation with a view to gaining economic benefits from its activities).

Corporate inventory program. A program to produce annual corporate inventories that are in keeping with the principles, standards, and guidance of the *GHG Protocol Corporate Standard*. This includes all institutional, managerial and technical arrangements made for the collection of data, preparation of a GHG inventory, and implementation of the steps taken to manage the quality of their emission inventory.

CO_2 equivalent. The universal unit of measurement to indicate the GWP of each of the six GHGs, expressed in terms of the GWP of one unit of CO_2. It is used to evaluate releasing (or avoiding releasing) different GHGs against a common basis.

Cross-sector calculation tool. A GHG Protocol calculation tool that addresses GHG sources common to various sectors, e.g., emissions from stationary or mobile combustion. See also GHG Protocol calculation tools (www.ghgprotocol.org).

De minimis. A level of emissions from a single source that is excluded from reporting. A predefined negative bias in estimates (i.e., an underestimate). Such a threshold is not compatible with the completeness principle of the *Corporate Standard*.

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

Direct monitoring. Direct monitoring of exhaust stream contents in the form of continuous emissions monitoring or periodic sampling.

Double counting. Two or more reporting companies take ownership of the same emissions or reductions.

Emissions. The release of GHG into the atmosphere.

Emission factor. A factor allowing GHG emissions to be estimated from a unit of available activity data (e.g., tonnes of fuel consumed, tonnes of product produced) and absolute GHG emissions.

Emission reduction unit (ERU). A unit of emission reduction generated by a JI project. ERUs are tradable commodities which can be used by Annex 1 countries to help them meet their commitment under the Kyoto Protocol.

Equity share. 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.

Estimation uncertainty. Uncertainty that arises whenever GHG emissions are quantified, due to uncertainty in data inputs and calculation methodologies used to quantify GHG emissions.

Finance lease. A lease which transfers substantially all the risks and rewards of ownership to the lessee and is accounted for as an asset on the balance sheet of the lessee. Also known as a capital or financial lease. Leases other than capital/ financial/finance leases are operating leases. Consult an accountant for further detail as definitions of lease types differ between various accepted accounting principles.

Fixed asset investment. Equipment, land, stocks, property, incorporated and non-incorporated joint ventures, and partnerships over which the parent company has neither significant influence nor control.

Fugitive emissions. Emissions that are not physically controlled but result from the intentional or unintentional releases of GHGs. They commonly arise from the production, processing transmission storage and use of fuels and other chemicals, often through joints, seals, packing, gaskets, etc.

Green power. A generic term for renewable energy sources and specific clean energy technologies that emit fewer GHG emissions relative to other sources of energy that supply the electric grid. Includes solar photovoltaic panels, solar thermal energy, geothermal energy, landfill gas, low-impact hydropower, and wind turbines.

Greenhouse gases. For the purposes of this standard, GHGs are the six gases listed in the Kyoto Protocol: CO_2, CH_4, N_2O, HFCs, PFCs, and SF_6.

GHG capture. Collection of GHG emissions from a GHG source for storage in a sink.

GHG credit. GHG offsets can be converted into GHG credits when used to meet an externally imposed target. A GHG credit is a convertible and transferable instrument usually bestowed by a GHG program.

GHG offset. Offsets are discrete GHG reductions used to compensate for (i.e., offset) GHG emissions elsewhere, for example to meet a voluntary or mandatory GHG target or cap. Offsets are calculated relative to a baseline that represents a hypothetical scenario for what emissions would have been in the absence of the mitigation project that generates the offsets. To avoid double counting, the reduction giving rise to the offset must occur at sources or sinks not included in the target or cap for which it is used.

GHG program. A generic term used to refer to any voluntary or mandatory international, national, sub-national, government or non-governmental authority that registers, certifies, or regulates GHG emissions or removals outside the company, e.g., CDM, EU ETS, CCX, and CCAR.

GHG project. A specific project or activity designed to achieve GHG emission reductions, storage of carbon, or enhancement of GHG removals from the atmosphere. GHG projects may be stand-alone projects, or specific activities or elements within a larger non-GHG related project.

GHG Protocol calculation tools. A number of cross-sector and sector-specific tools that calculate GHG emissions on the basis of activity data and emission factors (available at www.ghgprotocol.org).

GHG Protocol Initiative. A multi-stakeholder collaboration convened by WRI and WBCSD to design, develop, and promote the use of accounting and reporting standards for business. It comprises of two separate but linked standards—the *GHG Protocol Corporate Accounting and Reporting Standard* and the *GHG Protocol Project Quantification Standard*.

GHG Protocol Project Quantification Standard. An additional module of the GHG Protocol Initiative addressing the quantification of GHG reduction projects. This includes projects that will be used to offset emissions elsewhere and/or generate credits. More information available at www.ghgprotocol.org.

GHG Protocol sector specific calculation tools. A GHG calculation tool that addresses GHG sources that are unique to certain sectors, e.g., process emissions from aluminum production (see also GHG Protocol Calculation tools).

GHG public report. Provides, among other details, the reporting company's physical emissions for its chosen inventory boundary.

GHG registry. A public database of organizational GHG emissions and/or project reductions. For example, the DOE 1605b Voluntary GHG Reporting Program, CCAR, World Economic Forum's Global GHG Registry. Each registry has its own rules regarding what and how information is reported.

GHG removal. Absorbtion or sequestration of GHGs from the atmosphere.

GHG sink. Any physical unit or process that stores GHGs; usually refers to forests and underground/deep sea reservoirs of CO_2.

GHG source. Any physical unit or process which releases GHG into the atmosphere.

GHG trades. All purchases or sales of GHG emission allowances, offsets, and credits.

Global warming potential. A factor describing the radiative forcing impact (degree of harm to the atmosphere) of one unit of a given GHG relative to one unit of CO_2.

Group company/subsidiary. The parent company has the ability to direct the financial and operating policies of a group company/subsidiary with a view to gaining economic benefits from its activities.

Heating value. The amount of energy released when a fuel is burned completely. Care must be taken not to confuse higher heating values, used in the United States and Canada, and lower heating values, used in all other countries (for further details refer to the calculation tool for stationary combustion available at www.ghgprotocol.org).

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

Insourcing. The administration of ancillary business activities, formally performed outside of the company, using resources within a company.

Intensity ratios. Ratios that express GHG impact per unit of physical activity or unit of economic value (e.g., tonnes of CO_2 emissions per unit of electricity generated). Intensity ratios are the inverse of productivity/efficiency ratios.

Intensity target. A target defined by reduction in the ratio of emissions and a business metric over time e.g., reduce CO_2 per tonne of cement by 12 percent between 2000 and 2008.

Intergovernmental Panel on Climate Change.International body of climate change scientists. The role of the IPCC is to assess the scientific, technical and socio-economic information relevant to the understanding of the risk of human-induced climate change (www.ipcc.ch).

Inventory. A quantified list of an organization's GHG emissions and sources.

Inventory boundary. An imaginary line that encompasses the direct and indirect emissions that are included in the inventory. It results from the chosen organizational and operational boundaries.

Inventory quality. The extent to which an inventory provides a faithful, true, and fair account of an organization's GHG emissions.

Joint Implementation. The JI mechanism was established in Article 6 of the Kyoto Protocol and refers to climate change mitigation projects implemented between two Annex 1 countries. JI allows for the creation, acquisition, and transfer of "ERUs."

Kyoto Protocol. A protocol to the UNFCCC. Once entered into force, it will require countries listed in its Annex B (developed nations) to meet reduction targets of GHG emissions relative to their 1990 levels during the period of 2008–12.

Leakage (secondary effect). Leakage occurs when a project changes the availability or quantity of a product or service that results in changes in GHG emissions elsewhere.

Life-cycle analysis. Assessment of the sum of a product's effects (e.g., GHG emissions) at each step in its life cycle, including resource extraction, production, use, and waste disposal.

Material discrepancy. An error (for example from an oversight, omission, or miscalculation) that results in the reported quantity being significantly different to the true value to an extent that will influence performance or decisions. Also known as material misstatement.

Materiality threshold. A concept employed in the process of verification. It is often used to determine whether an error or omission is a material discrepancy or not. It should not be viewed as a *de minimus* for defining a complete inventory.

Mobile combustion. Burning of fuels by transportation devices such as cars, trucks, trains, airplanes, ships, etc.

Model uncertainty. GHG quantification uncertainty associated with mathematical equations used to characterize the relationship between various parameters and emission processes.

Non-Annex 1 countries. Countries that have ratified or acceded to the UNFCC but are not listed under Annex 1 and are therefore not under any emission reduction obligation (see also Annex 1 countries).

Operation. A generic term used to denote any kind of business, irrespective of its organizational, governance, or legal structures. An operation can be a facility, subsidiary, affiliated company, or other form of joint venture.

Operating lease. A lease which does not transfer the risks and rewards of ownership to the lessee and is not recorded as an asset in the balance sheet of the lessee. Leases other than operating leases are capital/financial/finance leases. Consult an accountant for further detail as definitions of lease types differ between various accepted financial standards.

Operational boundaries. The boundaries that determine the direct and indirect emissions associated with operations owned or controlled by the reporting company. This assessment allows a company to establish which operations and sources cause direct and indirect emissions, and to decide which indirect emissions to include that are a consequence of its operations.

Organic growth/decline. Increases or decreases in GHG emissions as a result of changes in production output, product mix, plant closures, and the opening of new plants.

Organizational boundaries. The boundaries that determine the operations owned or controlled by the reporting company, depending on the consolidation approach taken (equity or control approach).

Outsourcing. The contracting out of activities to other businesses.

Parameter uncertainty. GHG quantification uncertainty associated with quantifying the parameters used as inputs to estimation models.

Primary effects. The specific GHG reducing elements or activities (reducing GHG emissions, carbon storage, or enhancing GHG removals) that the project is intended to achieve.

Process emissions. Emissions generated from manufacturing processes, such as the CO_2 that arises from the breakdown of $CaCO_3$ during cement manufacture.

Productivity/efficiency ratios. Ratios that express the value or achievement of a business divided by its GHG impact. Increasing efficiency ratios reflect a positive performance improvement, e.g., resource productivity (sales per tonne GHG). Productivity/efficiency ratios are the inverse of intensity ratios.

Ratio indicator. Indicators providing information on relative performance such as intensity ratios or productivity/efficiency ratios.

Renewable energy. Energy taken from sources that are inexhaustible, e.g., wind, water, solar, geothermal energy, and biofuels.

Reporting. Presenting data to internal management and external users such as regulators, shareholders, the general public, or specific stakeholder groups.

Reversibility of reductions. This occurs when reductions are temporary, or where removed or stored carbon may be returned to the atmosphere at some point in the future.

Rolling base year. The process of shifting or rolling the base year forward by a certain number of years at regular intervals of time.

Scientific uncertainty. Uncertainty that arises when the science of the actual emission and/or removal process is not completely understood.

Scope. Defines the operational boundaries in relation to indirect and direct GHG emissions.

Scope 1 inventory. A reporting organization's direct GHG emissions.

Scope 2 inventory. A reporting organization's emissions associated with the generation of electricity, heating/cooling, or steam purchased for own consumption.

Scope 3 inventory. A reporting organization's indirect emissions other than those covered in scope 2.

Scope of works. An up-front specification that indicates the type of verification to be undertaken and the level of assurance to be provided between the reporting company and the verifier during the verification process.

Secondary effects (leakage). GHG emissions changes resulting from the project not captured by the primary effect(s). These are typically the small, unintended GHG consequences of a project.

Sequestered atmospheric carbon. Carbon removed from the atmosphere by biological sinks and stored in plant tissue. Sequestered atmospheric carbon does not include GHGs captured through carbon capture and storage.

Significance threshold. A qualitative or quantitative criteria used to define a significant structural change. It is the responsibility of the company/verifier to determine the "significance threshold" for considering base year emissions recalculation. In most cases, the "significance threshold" depends on the use of the information, the characteristics of the company, and the features of structural changes.

Stationary combustion. Burning of fuels to generate electricity, steam, heat, or power in stationary equipment such as boilers, furnaces, etc.

Structural change. A change in the organizational or operational boundaries of a company that result in the transfer of ownership or control of emissions from one company to another. Structural changes usually result from a transfer of ownership of emissions, such as mergers, acquisitions, divestitures, but can also include outsourcing/insourcing.

Target base year. The base year used for defining a GHG target, e.g., to reduce CO_2 emissions 25 percent below the target base year levels by the target base year 2000 by the year 2010.

Target boundary. The boundary that defines which GHG's, geographic operations, sources, and activities are covered by the target.

Target commitment period. The period of time during which emissions performance is actually measured against the target. It ends with the target completion date.

Target completion date. The date that defines the end of the target commitment period and determines whether the target is relatively short term or long term.

Target double counting policy. A policy that determines how double counting of GHG reductions or other instruments, such as allowances issued by external trading programs, is dealt with under a GHG target. It applies only to companies that engage in trading (sale or purchase) of offsets or whose corporate target boundaries interface with other companies' targets or external programs.

Tonnes. One metric ton, with a mass equal to 1,000 kilograms, or 2,205 pounds.

Uncertainty.

1. Statistical definition: A parameter associated with the result of a measurement that characterizes the dispersion of the values that could be reasonably attributed to the measured quantity (e.g., the sample variance or coefficient of variation).

2. Inventory definition: A general and imprecise term which refers to the lack of certainty in emissions-related data resulting from any causal factor, such as the application of non-representative factors or methods, incomplete data on sources and sinks, lack of transparency, etc. Reported uncertainty information typically specifies a quantitative estimate of the likely or perceived difference between a reported value and a qualitative description of the likely causes of the difference.

United Nations Framework Convention on Climate Change. Signed in 1992 at the Rio Earth Summit, the UNFCCC is a milestone Convention on Climate Change treaty that provides an overall framework for international efforts to (UNFCCC) mitigate climate change. The Kyoto Protocol is a protocol to the UNFCCC.

Value chain emissions. Emissions from the upstream and downstream activities associated with the operations of the reporting company.

Verification. An independent assessment of the reliability (considering completeness and accuracy) of a GHG inventory.