Carbon Accounting
Corporate Accounting and Reporting Standards

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Two major standard methods:

- International Organization for Standardization (ISO) ISO 14064
- World Resources Institute and World Business Council for Sustainable Development, Greenhouse Gas Protocol (more robust)

- If one standard is met, the other is also likely to be met

Common elements to the two standards:

- Determining boundaries for GHG accounting
- Classifying emissions
- Identifying and calculating GHG emissions
- Providing rules for changing base year inventories
- Providing rules for tracking emissions over time
- Providing rules for assessing uncertainty
- Providing rules for reporting

Greenhouse Gas Protocol Initiative

- A multi-stakeholder partnership of businesses, nongovernmental organisations (NGOs), governments, academics, and others, convened by:
  - World Resources Institute
  - World Business Council for Sustainable Development
- Two linked documents:
  - GHG Protocol Corporate Accounting and Reporting Standard: evaluation of an organization
  - GHG Protocol Project Quantification Standard: evaluation of a project

- WWW.ghgprotocol.org
GHG Protocol Corporate Accounting and Reporting Standard

• WWW.ghgprotocol.org
Global trends point to having a GHG inventory

- Global warming and climate change coming to fore as sustainability issues
- Governments are making national policies including: emissions trading programs, voluntary programs, carbon or energy taxes, regulations, standards on energy efficiency and emissions’
- Companies must understand their position in GHG’s to ensure long term success
Business goals served by a GHG inventory:

- Managing GHG risks and identifying reduction opportunities
- Public reporting and participation in voluntary GHG programs
- Participating in mandatory reporting programs
  - Facilities in Europe under the Integrated Pollution Prevention and Control (IPPC) Directive must report emissions
- Participating in GHG markets
  - The Chicago Climate Exchange, CCX, is a voluntary reduction marketplace consisting of corporations, state and local governments and various institutions.
- Recognition for early voluntary action.
GHG accounting and reporting principles:

- Relevance
- Completeness
- Consistency
- Transparency
- Accuracy
Setting *Organizational* boundaries:

- **Equity share approach**
  - Under the equity share approach, a company accounts for GHG emissions from operations according to its share of equity in the operation.

- **Control approach**
  - Under the control approach, a company accounts for 100 percent of the GHG emissions from operations over which it has control. It does not account for GHG emissions from operations in which it owns an interest but has no control.
    - Can either be financial control or operational control
  - Potential for double counting if 2+ companies hold mutual interests but use different approaches
Setting *Operational* boundaries:

- Direct GHG emissions are emissions from sources that are owned or controlled by the company.
- Indirect GHG emissions are emissions that are a consequence of the activities of the company but occur at sources owned or controlled by another company.
Scope 1: Direct GHG emissions:

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

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

• GHG emissions not covered by the Kyoto Protocol, e.g. CFCs, NOx, etc. shall not be included in scope 1 but maybe reported separately (see chapter 9).
Scope 2: Electricity indirect emissions:

- GHG emissions from the generation of purchased electricity consumed in its owned or controlled equipment or operations by the company.
- Transmission and distribution losses are considered emissions of the company that controls the T&D operation.
- Structure to eliminate double counting in scopes 1 and 2
Scope 3: Other indirect GHG emissions

• A consequence of the activities of the company, but occur from sources not owned or controlled by the company.
• Some examples of scope 3 activities are extraction and production of purchased materials; transportation of purchased fuels; and use of sold products and services.
• Leased assets, outsourcing, franchises may be accounted in Scope 3
• Need not have an extensive GHG LCA of everything.
  – Describe the value chain
  – Define which scope 3 emissions are relevant: large, risk exposure, critical by stakeholders, potential reductions
• Example where critical: the company’s product uses fossil fuel or electricity in use. The company can influence company design to reduce GHG emissions. (Levi’s jeans)
DHL Nordic Express: case for accounting for outsourced services (Scope 3)

- A major transportation and logistics company
- Large and special load transport, courier, express, specialty business services.
- 98% of emissions are from transport of goods by partner transportation firms.
- Scope 1: 7265 tCO2
- Scope 2: 52
- Scope 3: 327,634
- Total: 334,951
Setting Organizational and operational boundaries

• Organization X is a parent company that has full ownership and financial control of operations A and B, but only a 30% non operated interest and no financial control in operation C.
• Choose either equity share or financial control
  – Equity control: 100% of A and B, 30% of C
  – Financial control: 100% of A and B, 0% of C
• Decide whether to account for only scopes 1 and 2 or to include scope 3

![Overview of scopes and emissions across a value chain](image-url)
Example scopes for diffit industries:

<table>
<thead>
<tr>
<th>SECTOR</th>
<th>SCOPE 1 EMISSION SOURCES</th>
<th>SCOPE 2 EMISSION SOURCES</th>
<th>SCOPE 3 EMISSION SOURCES</th>
</tr>
</thead>
<tbody>
<tr>
<td>MINERALS</td>
<td>• Process emissions (calcination of limestone)</td>
<td>• Stationary combustion (consumption of purchased electricity, heat or steam)</td>
<td>• Stationary combustion (production of purchased materials, waste combustion)</td>
</tr>
<tr>
<td></td>
<td>• Stationary combustion (clinker kiln, drying of raw materials, production of electricity)</td>
<td></td>
<td>• Process emissions (production of purchased clinker and lime)</td>
</tr>
<tr>
<td></td>
<td>• Mobile combustion (quarry operations, on-site transportation)</td>
<td></td>
<td>• Mobile combustion (transportation of raw materials/products/waste, employee business travel, employee commuting)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Fugitive emissions (mining and landfill CH₄ and CO₂, outsourced process emissions)</td>
</tr>
<tr>
<td>WASTE</td>
<td>• Stationary combustion (incinerators, boilers, flaring)</td>
<td>• Stationary combustion (consumption of purchased electricity, heat or steam)</td>
<td>• Stationary combustion (recycled waste used as a fuel)</td>
</tr>
<tr>
<td>Landfills, Waste combustion, Water services</td>
<td>• Process emissions (sewage treatment, nitrogen loading)</td>
<td></td>
<td>• Process emissions (recycled waste used as a feedstock)</td>
</tr>
<tr>
<td></td>
<td>• Fugitive emissions (CH₄ and CO₂ emissions from waste and animal product decomposition)</td>
<td></td>
<td>• Mobile combustion (transportation of waste/products, employee business travel, employee commuting)</td>
</tr>
<tr>
<td></td>
<td>• Mobile combustion (transportation of waste/products)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PULP &amp; PAPER</td>
<td>• 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)</td>
<td>• Stationary combustion (consumption of purchased electricity, heat or steam)</td>
<td>• Stationary combustion (production of purchased materials, waste combustion)</td>
</tr>
<tr>
<td>Pulp and Paper</td>
<td></td>
<td></td>
<td>• Process emissions (production of purchased materials)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Mobile combustion (transportation of raw materials/products/waste, employee business travel, employee commuting)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Fugitive emissions (landfill CH₄ and CO₂ emissions)</td>
</tr>
</tbody>
</table>
Tracking Emissions Over Time

- Companies may be restructured over time
- Meaningful comparison over this time requires a recalculation of historic emission data
- Choose a base year emissions
- No recalculation for organic growth or decline. Organic growth is change in production output, product mix, closures/openings within the owned/controlled company.
Calculating GHG Emissions

**Figure 9.**
Steps in identifying and calculating GHG emissions

1. Identify Sources
2. Select Calculation Approach
3. Collect Data and Choose Emission Factors
4. Apply Calculation Tools
5. Roll-up Data to Corporate Level
Identifying GHG Emissions

- Stationary combustion: combustion of fuels in boiler as an example
- Mobile combustion: fuels combusted in transportation devices
- Process emissions: emissions from physical or chemical processes, CO2 from calcining in cement mfg as an example
- Fugitive emissions: intentional and unintentional releases such as equipment leaks from joints, seals, packing, gaskets, as well as fugitive emissions from coal piles, wastewater treatment, pits, cooling towers, gas processing facilities, etc.
Identifying GHG Emissions

- Identify scope 1 emissions
- Identify scope 2 emissions
- Identify scope 3 emissions (optional): identify emissions from upstream and downstream and outsourced mfg, leases, franchises not in scopes 1 or 2
Calculating GHG Emissions

• Direct measurements unlikely

• More likely
  – Identify mass flows and stoichiometric relationships in processes
  – Use documented emissions factors to determine the emissions for a particular flow
  – Scope 1 based on flows of fuels purchased, and flows with known emissions due to stoichiometric considerations
  – Scope 2 based on metered electricity consumption and supplier specific emission factors
  – Scope 3 calculated from activity data such as fuel use or passenger miles or published third party emission factors

• Calculation tools available from ghgprotocol.com
**TABLE 3. Overview of GHG calculation tools available on the GHG Protocol website**

<table>
<thead>
<tr>
<th>Calculation Tools</th>
<th>Main Features</th>
</tr>
</thead>
</table>
| **Stationary Combustion** | - Calculates direct and indirect CO₂ emissions from fuel combustion in stationary equipment  
- Provides two options for allocating GHG emissions from a co-generation facility  
- Provides default fuel and national average electricity emission factors |
| **Mobile Combustion** | - Calculates direct and indirect CO₂ 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 air-conditioning equipment in commercial applications  
- Provides three calculation methodologies: a sales-based approach, a life cycle stage based approach, and an emission factor based approach |
| **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 |
| **Aluminum and other non-Ferrous Metals Production** | - Calculates direct GHG emissions from aluminum production (CO₂ from anode oxidation, PFC emissions from the "anode effect," and SF₆ used in non-ferrous metals production as a cover gas) |
| **Iron and Steel** | - Calculates direct GHG emissions (CO₂) from oxidation of the reducing agent, from the calculation of the flux used in steel production, and from the removal of carbon from the iron ore and scrap steel used |
| **Nitric Acid Manufacture** | - Calculates direct GHG emissions (N₂O) from the production of nitric acid |
| **Ammonia Manufacture** | - Calculates direct GHG emissions (CO₂) 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 (N₂O) from adipic acid production |
| **Cement** | - Calculates direct CO₂ emissions from the calcination process in cement manufacturing (WBCSD tool also calculates combustion emissions)  
- Provides two calculation methodologies: the cement-based approach and the clinker-based approach |
| **Lime** | - Calculates direct GHG emissions from lime manufacturing (CO₂ from the calcination process) |
| **HFC-23 from HFC-22 Production** | - Calculates direct HFC-23 emissions from production of HCFC-22 |
| **Pulp and Paper** | - Calculates direct CO₂, CH₄, and N₂O emissions from production of pulp and paper. This includes calculation of direct and indirect CO₂ emissions from combustion of fossil fuels, bio-fuels, and |
Rolling up GHG emissions data to corporate level

• Centralized: individual facilities report activity/fuel use data to the corporate level where GHG emissions are calculated
  – Office based organizations where calculations are standard across a number of facilities

• Decentralized: individual facilities collect activity/fuel use data, directly calculate GHG emissions and report to the corporate level
  – If detailed process knowledge is required
  – GHG emissions calculation methods vary across facilities
  – Resources and tools are available at the facilities
  – Local regulations require this at the facilities
Reporting guidance for GHG emissions

- Description of emission sources
- List and justification of exclusions and inclusions
- Comparative info from previous years
- Reporting period covered
- Trends in the data
- Progress towards business targets
- Discussion of uncertainties
- Description of events that impact reported data (closures, calc methods, boundary changes)
Managing Inventory Quality

- Developing a credible and unbiased GHG emissions report requires some effort in managing quality
- Provides a system to prevent and correct errors
Accounting for GHG Reductions

- *GHG Protocol Project Quantification 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.
Accounting for GHG Reductions

• Baseline selection, what would happen if the project did not occur

• Demonstration of additionality,
  – must demonstrate reductions AND
  – show that the project itself is not the baseline, that if the project went away their would be higher global emissions (ie., non-additional)

• ID and quantify relevant secondary (unintended effects) of project

• Consideration of reversibility, that reductions are temporary

• Avoidance of double counting, defining scope
Example: Accounting for GHG Reductions

• Alcoa (aluminum mfg) wants to implement strategies to lower its GHG emissions
• Purchases renewable energy certificates (RECs) which represent the environmental benefits from electricity generated from renewable rather than fossil fuel sources
• In 2003 purchased RECs equivalent to 100% of electricity use in 4 corporate offices in TN, PA, NY
• Electricity from land fill gas avoiding 6.3 million kg of CO2 annually
Reporting GHG Emissions

• Reported information shall be “relevant, complete, consistent, transparent and accurate.” The following is required:
• Methods and boundaries
• The GHG Protocol Corporate Standard requires reporting a minimum of total scope 1 and scope 2 emissions, independent of GHG trades.
• Emissions data separately for each scope.
• Emissions data for all six GHGs separately (CO₂, CH₄, N₂O, HFCs, PFCs, SF₆) in metric tonnes and in tonnes of CO₂ equivalent.
• Base case year results and explanations of recalculations
• Emissions data for direct CO₂ emissions from biologically sequestered carbon (e.g., CO₂ from burning biomass/biofuels), reported separately from the scopes.
• Methods used for calculations including tools
• Specific exclusions of sources, facilities or operations
Reporting GHG Reductions

• Required Company and Inventory Boundary
  – Organizational boundary and consolidation approach
  – Outline of operational boundary and if Scope 3 is included with list of activities covered
  – Reporting period
  – Total scope Baseline selection, what would happen if the project did not occur

• Required Info on Emissions
  • Total scope 1 and 2 emissions independent of any GHG trades such as sales, purchases, transfers, or banking of allowances.
  • Emissions data separately for each scope.
  • Emissions data for all six GHGs separately (CO\(_2\), CH\(_4\), N\(_2\)O, HFCs, PFCs, SF\(_6\)) in metric tonnes and in tonnes of CO\(_2\) equivalent.
  • Year chosen as base year, and an emissions profile over time
  • Appropriate context for any significant emissions changes that trigger base year emissions recalculation
  • Emissions data for direct CO\(_2\) emissions from biologically sequestered carbon (e.g., CO\(_2\) from burning biomass/biofuels), reported separately from the scopes.
  • Methodologies used to calculate or measure emissions, providing a reference or link to any calculation tools used.
  • Any specific exclusions of sources, facilities, and/or operations.
Reporting GHG Emissions

- Optional items
  - Scope 3 emissions
  - Further divided data (e.g., By facility)
  - Emissions from self generated electricity, heat or steam sold externally
  - Performance against benchmarks
  - Emissions from GHGs not covered by the Kyoto Protocol (e.g., CFCs, NOx), reported separately from scopes.
  - Others
    - Information on offsets that have been purchased or developed outside the inventory boundary, and if certified
    - Information on reductions at sources inside the inventory boundary that have been sold/transferred as offsets to a third party and if certified
  - Reporting on ratio indicators
Verification of GHG Emissions

- 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 being significantly different to the true value or meaning.
- An error is considered materially misleading if its value exceeds 5% of the total inventory for the part of the organization being verified.
- Independent verifiers are useful (PricewaterhouseCoopers) evaluate both
  - Whether GHG accounting and reporting has been correctly implemented
  - Identification of any material discrepancies.
Setting a GHG Target

• Minimizing and managing GHG risks
• Achieving cost savings
• Stimulation innovation
• Preparing for future regulations
• Demonstrating leadership and corporate responsibility
• Participating in voluntary programs
FIGURE 12. Steps in setting a GHG target

1. Obtain senior management commitment
2. Decide on the target type
   - Set an absolute or intensity target?
3. Decide on the target boundary
   - Which GHGs to include?
   - Which direct and indirect emissions?
   - Which geographical operations?
   - Treat business types separately?
4. Choose the target base year
   - Use a fixed or rolling approach?
   - Use a single or multi-year approach?
5. Define the target completion date
   - Set a long- or short-term target?
6. Define the length of the target commitment period
   - Set a one-year or multi-year commitment period?
7. Decide on the use of offsets or credits
8. Establish a target double counting policy
   - How to deal with double counting of reductions across companies?
   - How does GHG trading affect target performance?
9. Decide on the target level
   - What is business-as-usual? How far to go beyond that?
   - How do all the above steps influence the decision?
10. Track and report progress
    - Make regular performance checks
    - Report information in relation to the target.

BOX 5. Selected corporate GHG targets

**ABBE** Reduce GHGs by 1 percent each year from 1998 through 2005

**Alcoa** Reduce GHGs by 25 percent from 1990 levels by 2010, and 50 percent from 1990 levels over same period, if inert anode technology succeeds

**BP** Hold net GHGs stable at 1990 levels through 2012

**DuPont** Reduce GHGs by 65 percent from 1990 levels by 2010

**Entergy** Stabilize CO₂ from U.S. generating facilities at 2000 levels through 2005

**Ford** Reduce CO₂ by 4 percent over 2003-2006 timeframe based upon average 1998-2001 baseline as part of Chicago Climate Exchange

**Intel** Reduce PFCs by 10 percent from 1995 levels by 2010

**Johnson & Johnson** Reduce GHGs by 7 percent from 1990 levels by 2010, with interim goal of 4 percent below 1990 levels by 2005

**Polaroid** Reduce CO₂ emissions 20 percent below its 1994 emissions by year-end 2005; 25 percent by 2010

**Royal DutchShell** Manage GHG emissions so that they are still 5 percent or more below the 1990 baseline by 2010, even while growing the business

**Transalta** Reduce GHGs to 1990 levels by 2006. Achieve zero net GHGs from Canadian operations by 2024

**Holcim Ltd.** Reduce by the year 2010 the Group average specific net CO₂ emissions by 20 percent from the reference year 1990

**Kansai Electric Power Company** Reduce CO₂ emissions per kWh sold in fiscal 2010 to approx. 0.34 kg CO₂/kWh

**Miller Brewing Company** Reduce GHGs by 10 percent per barrel of production from 2001 to 2006

**National Renewable Energy Laboratory** Reduce GHGs by 10 percent per square foot from 2000 to 2005

**SC Johnson** GHG emissions intensity reduction of 23 percent by 2005, which represents an absolute or actual GHG reduction of 8 percent

**Lafarge** Reduce absolute gross CO₂ emissions in Annex I countries 10 percent below 1990 levels by the year 2010. Reduce worldwide average specific net CO₂ emissions 20 percent below 1990 levels by the year 2010²
Questions?