

Introduction to Greenhouse Gas Accounting

New to GHG accounting? Start here.

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Part 1. Setting Boundaries

Before you start data collection, some important decisions need to be made. First, you will need to define the **organizational**, **operational**, and **temporal boundaries** for your inventory, in order to determine what emissions sources you will be tracking.

While considering these boundaries, keep this question in the back of your mind: For what emissions should my institution be held accountable?

Organizational Boundaries

Question to answer -- **Where** am I measuring and reporting emissions? There are two types of approach to this question:

- Control approach: Measure emissions from any operation over which you have practical control.
- Equity approach: Measure emissions from facilities where you have some degree of ownership.

Either approach may be more relevant to your institution, depending on the way it's organized. Choosing one approach and applying it consistently will provide the most useful and comprehensive outputs.

Note: For signatories to the ACUPCC, the organizational boundaries approach is chosen as a part of the agreement. ACUPCC breaks down the control approach into two separate categories: operational and financial.

These are the approaches available for ACUPCC signatories:

- *Equity Share Approach*—under this approach, your institution would account for GHG emissions from each operation according to its share of economic interest in the operation, which is the extent of rights your institution has to the risks and rewards flowing from an operation.

- *Operational Control Approach*—under this approach, your institution would account for GHG emissions from operations under its operational control, which refers to the authority to introduce and implement operating policies at an operation.
- *Financial Control Approach*—under this approach, your institution would account for GHG emissions from operations under its financial control, which refers to the ability to direct the financial and operating policies of an operation with an interest in gaining economic benefits from its activities.

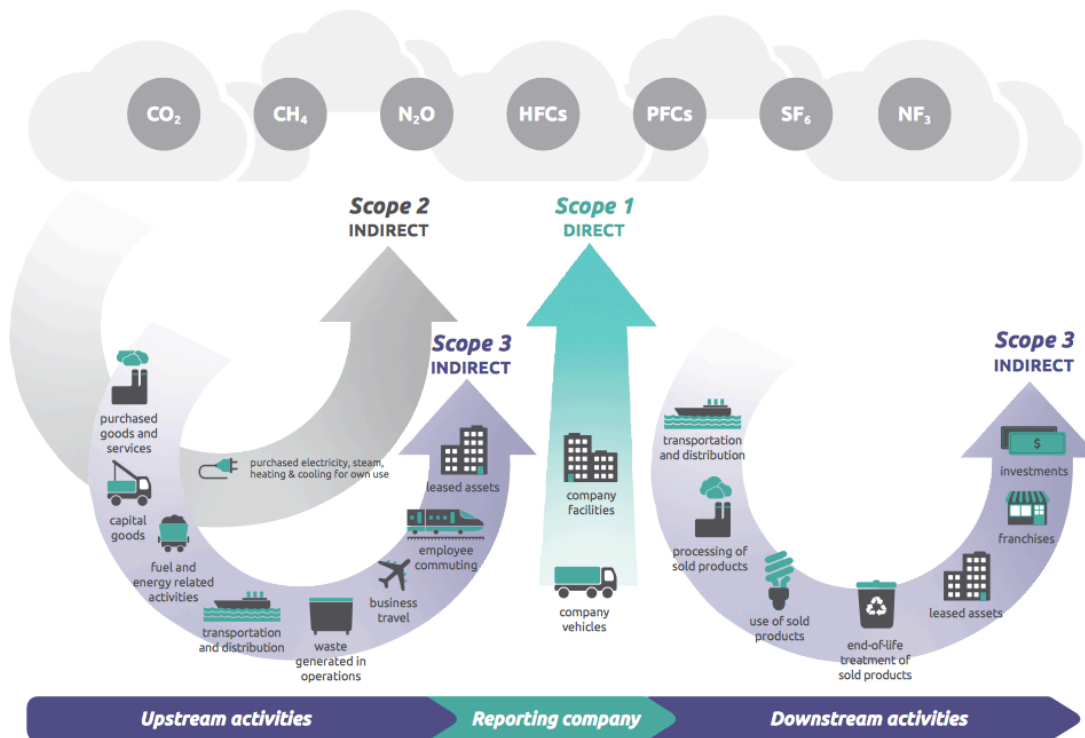
Guidance on selecting the appropriate methodology can be found in The Climate Registry’s [General Reporting Protocol](#) or in the [Greenhouse Gas Protocol Corporate Accounting and Reporting Standard](#).

Operational Boundaries

Question to answer -- **Which** emission sources will be measured and reported? The greatest challenge here is to create a comprehensive inventory without “double-counting” emissions from sources that may also be used by other entities.

The Greenhouse Gas (GHG) Protocol (on which the CCC’s methodologies are based) describes three Scopes, or levels of responsibility for control over different sources of emissions.

Figure [1] Overview of GHG Protocol scopes and emissions across the value chain



- **Scope 1**
 - Direct emissions from sources that are owned and/or controlled by your institution.
 - Example: On-campus fuel combustion for electricity generation
- **Scope 2**
 - Indirect emissions from sources that are neither owned nor operated by your institution but whose products are directly linked to on-campus energy consumption.
 - Example: Electricity purchased from a third party

- **Scope 3**
 - Other indirect emissions that are a consequence of your institution’s activities, but are from sources neither owned nor controlled by the institution.
 - Example: Air travel for study abroad

These boundaries will determine how comprehensive your inventory is, and how effective your carbon management strategies can be. It is recommended that you track all Scope 1 and 2 emissions, and as much of Scope 3 as data is available.

Note: The ACUPCC requires the following, at minimum:

- All of Scope 1 and Scope 2
- From Scope 3:
 - Student, staff, and faculty commuting
 - Air travel directly financed by the institution that is related to study abroad activities

Temporal Boundaries

Question to answer – **When** did the emissions take place?

The CCC can track emissions from 1990 onward, but this doesn’t mean that you must enter data for all of those years. Start with the earliest year for which you have solid, complete data.

Accepted best practice is to use fiscal year, rather than calendar year data. (For most institutions, FY2014 is the period ending June 30, 2014.)

Part 2. Keeping a Collection Journal

A detailed journal of your data collection efforts will help to facilitate communication and prevent you from losing threads of investigation.

The journal should include:

- Who was contacted
- When they were contacted
- What information was requested and/or received

This living document will become an important resource to consult if questions arise about the data collection process, especially when the inventory is passed along to newer staff members or students for updates in the future.

Your journal should reside in a central location where it can be backed up, and where everyone involved in data collection can access it.

Part 3. Data Collection

Here we will go through the types of data you will need and some examples of each.

Institutional Data

Institutional data is used to normalize emission findings for comparison with other institutions, and for projecting future emission trends. This data also provides a context for fluctuations in emissions over time.

The required institutional data falls into three categories:

- Population – annual number of
 - Faculty
 - Staff
 - Full-time, part-time, and summer students
- Budgetary – annual budgets for
 - Operations
 - Research (amount received in research grants from external sources)
 - Energy
- Building space – annual
 - Total building space
 - Research building space

If any of these categories is not relevant to your institution, don't worry about it!

The number of full-time students, faculty, staff, and gross square feet of building space are the most important pieces of information in this section.

Scope 1 Data

Remember that Scope 1 includes sources that are directly owned and/or controlled by your institution. The categories of Scope 1 data include the following:

- On-campus stationary fuel sources
- Direct transportation sources
- Refrigeration and other chemical sources
- Agriculture
- Waste water, if treated within organizational boundaries

Below you'll find examples of possible emissions sources within the Scope 1 category, and notes on what units of measure will be required for entry into the CCC.

- On-campus stationary fuel sources:
 1. Oil usage
 2. Coal usage
 3. Natural gas usage
 4. Other fuels used for power generation
 5. Cogeneration output and efficiency
- ✓ For liquid fuels, data should be in gallons. For solid fuels, data should be in short tons.

- Direct transportation sources:
 1. Waste collection trucks
 2. Moving equipment
 3. Buses
 4. Maintenance vehicles
 5. Aircraft
 - ✓ Data should be collected/input in gallons of fuel for liquid fuels, or MMBtu for gas fuels.

- Refrigerants and chemical sources:
 1. This category considers perfluorocarbon (PFC), hydrofluorocarbon (HFC), and SF₆ (sulfur hexafluoride) emissions. These chemicals are powerful greenhouse gases, and in some cases can be thousands of times more potent than CO₂. Emissions result when these chemicals leak from the systems that use them—which is indicated because such leakage results in the need to refill/replace them periodically.
 2. Since PFC and HFC releases are required to be reported to the EPA, this information should be readily available.
 3. Quantities of these emissions tend to be inconsistent from year to year.
 4. If these sources account for less than 5% of total emissions, they can be considered *de minimus* emissions, and are not required to be reported. However, since this determination requires that the data be collected anyway, it may be useful to your institution to report these emissions.
 - ✓ Data should be collected in pounds of each chemical released (and thus replaced).

- Agricultural sources:

These include methane (CH₄) and nitrous oxide (N₂O) emissions from agriculture, which can come from applied fertilizers and from the gut and manure of animals. You will need to collect info on any of the following activities:

 1. Application of organic fertilizers
 2. Application of synthetic fertilizers.
 - ✓ For either type of fertilizer, you will need two pieces of information: the total amount fertilizer used (in pounds), AND the nitrogen content of those fertilizers (expressed as a percentage). If you have multiple organic or synthetic fertilizer mixtures, you will need to calculate a weighted average for N content for each.
 3. Dairy Cows maintained
 4. Beef Cows maintained
 5. Swine maintained
 6. Goats maintained
 7. Sheep maintained
 8. Horses maintained
 9. Poultry maintained
 10. Other ruminants maintained
 - ✓ For animals, you need a head count for each species.

Scope 2 Data

Scope 2 includes emissions that are produced by and at facilities that are not owned or operated by your institution, but whose products are directly related to on-campus energy consumption.

These include emissions are associated with utility generation of:

- ✓ electricity
- ✓ thermal energy.

For these sources, you will need to collect information regarding any of the following that occur at your institution:

1. Purchase of electricity
 - ✓ The quantity of purchased electricity will need to be input in kWh.
 - ✓ The fuel mix for the electricity will be input either by indicating the “E-Grid” region of the country in which your school is located (based on the Map provided in the Calculator) or, if you wish to calculate these emissions using a utility-specific or other “custom” fuel mix, you will need the percentage of different fuels used (specifically, the percentage of coal, natural gas, oil, biomass, wind, solar, or “net purchased” generation—which information can usually be obtained by your utility. The calculator’s default electricity fuel mix is the US average for the year in question.
2. Purchase of steam (for heating)
3. Purchase of steam chilled water (for cooling)
 - ✓ The quantity of steam and/or chilled water purchased will need to be input in MMBtu.
 - ✓ For these sources, you will need to determine the fuel mix used (ie. percentage of coal, oil, natural gas or biomass in the fuel mix) and the approximate loss of energy through the pipes as the steam or chilled water was transported to your institution. This information may be available on your provider’s website. The calculator has default numbers input for these variables.

Scope 3 Data

Scope 3 emissions come from sources that are not owned or operated by your institution but are either directly financed or linked to the campus by influence or encouragement. These include emissions from:

- Commuting
- Directly financed outsourced transportation
- Study abroad air travel
- Solid waste disposal
- Paper purchasing
- Wastewater treatment

In the following pages, you’ll find examples and guidance for collecting Scope 3 data.

➤ Commuting

1. This may be the most difficult data to gather. Here are the basic steps:
 - a. Estimate the number of faculty (full-time equivalent, or FTE), staff (FTE), and student commuters and their modes of transportation. Consider each of these three populations independently.
 - b. Estimate the miles per one-way trip for each population, limiting the distance to that between school and home.
 - c. Estimate the number of trips taken per week for each population.
 - d. Estimate the number of weeks per year that each population commutes.
- ✓ Collection of this data may require conducting a survey, or gather data from past surveys. You could also try to gather zip codes for everyone and use an online map service to find distances.

➤ Directly Financed Outsourced Travel

This category includes travel paid for by the university that uses non-university vehicles. Examples include the following types of reimbursed travel:

1. Bus
 2. Taxi
 3. Ferry
 4. Rental car
 5. Personal car
 6. Air travel
- ✓ The Calculator takes inputs in this section in passenger miles. Often, this information can be found on travel reimbursement forms. In some cases, you may have to estimate the number of passenger miles traveled based on the cost or the itinerary.

➤ Study Abroad

If your institution encourages or requires study abroad, it may want to report these programs' impacts.

1. Air travel (expressed in passenger miles)

➤ Solid Waste (Trash)

Most institutions manage solid waste through sending it off campus for incineration or landfill disposal.

1. Quantity of trash disposed of (in short tons)
 - ✓ This quantity should be entered in the column of the calculator that corresponds to the waste disposal method used by your campuses' waste service provider:
 - a. Mass burn incinerator (see www.epa.gov/ttnchie1/ap42/ch02/final/c02s01.pdf, pp1-2)
 - b. Refuse-derived fuel incinerator (see www.epa.gov/ttnchie1/ap42/ch02/final/c02s01.pdf)
 - c. Landfill with no CH₄ collection
 - d. Landfill that collects CH₄ emissions for flaring
 - e. Landfill that collects CH₄ emissions for electricity generation

➤ Paper Purchasing

The Calculator can provide an estimate of the emissions from producing the paper products your institution purchases. First, determine what types of paper from the list below will be included in your inventory. Next, determine what data is available. This may involve contacting many departments and offices within your institution, or you may have a central procurement officer who already tracks this information. Your final paper purchase figures will probably involve some estimation.

1. Office paper

- a. Uncoated freesheet - includes printer paper, bond, ledger, offset, envelopes, tablet, copy paper, books, and business form paper
- b. Coated freesheet - includes high-quality printing materials such as illustrated books, high quality posters, magazines and advertising pieces.

2. Other Papers (see <http://calculator.environmentalpaper.org/home> for definitions)

- c. Uncoated groundwood
- d. Coated groundwood
- e. Supercalendaring
- f. Corrugated Bleached
- g. Corrugated Semi-Bleached
- h. Corrugated Un-Bleached
- i. Paperboard SBS
- j. Paperboard CUK
- k. Paperboard Uncoated Bleached Kraft
- l. Paperboard Uncoated Unbleached Kraft
- m. Paperboard Coated Recycled

- ✓ For input into the Calculator, you will need the number of pounds of each type of each paper, and the percentage of recycled content in each.

➤ Wastewater Treatment

The Calculator can provide an estimate of the emissions that result from treating the wastewater you send off-campus to treatment plants. You will need to collect information about the quantity (in gallons) of wastewater being treated, and which treatment method/s is/are relevant to your campus:

- 1. Septic System
- 2. Central Treatment System: Aerobic treatment
- 3. Central Treatment System: Anaerobic treatment
- 4. Centralized system: Anaerobic digestion

Identifying Offsets

If your institution can use its financial control over outside entities in a way that creates a net reduction in worldwide carbon emissions that otherwise would not have occurred, you can declare that you have “offset” another entity’s carbon emissions.

Many universities offset some of their GHG emissions by purchasing renewable energy credits (RECs). These credits represent the fact that electricity was produced using renewable energy sources, like wind, solar, and hydroelectric.

Offsets can also include carbon sinks such as campus-owned forested land, compost, and off-campus carbon reduction projects funded by the university. Some campuses have begun to study rates of carbon sequestration on their forested lands. However, there is not yet an accepted protocol or standard for reporting carbon sequestration in forests.