GUIDANCE FOR COMPLETING A GREENHOUSE GAS INVENTORY

Introduction

Completing a greenhouse gas inventory may be a new reporting activity for many post-secondary institutions; this can be eased by having an established process in place to streamline key steps. This document provides guidance and support for post-secondary institutions by helping to define the process for completing a greenhouse gas inventory efficiently and aims to help overcome two primary barriers, identifying the correct individual/role who has access to required data and locating relevant emissions factors. It is recommended to start the process four months ahead of time to leave plenty of room for any potential roadblocks. An additional two months should be allotted if consultants are utilized to create the inventory from provided data.

The steps below provide a simple process of how to complete a greenhouse gas inventory:

Step 1: Establish the scope.

Step 2: Identify relevant individuals.

Step 3: Identify data type, units, and emission factors.

Step 4: Collect data.

Step 5: Input data.

Completing a Greenhouse Gas Inventory

Steps 1 and 2: Establish the Scope and Identify Relevant Individuals

The table below is meant to serve as a support for key areas of greenhouse gas measuring and reporting. Use the middle column in the table below to identify any necessary changes (additional inclusions or exclusions) to the inventory scope based on the institution's specific areas of concern and abilities. After completion, use the far right column in the table below as a guide to identifying individuals with access to the activity data.

Activity	Include in Inventory? Y/N	Starting Point for Data Collection
Natural Gas Consumption		• Energy Manager. • Facilities Administration staff, they can provide the information themselves or re-direct to the appropriate individual.
Fleet Fuel		• Begin with Security to gather a list of fleet vehicles. Security should be able to direct you to the appropriate individual who manages fleet kilometres and/or fuel purchasing, this will most likely an Administration staff member within a department such as Ancillary Services. • Facilities Administration staff, they can direct to the appropriate individual or provide the information themselves.
Generator Fuel		• Mechanical and/or Electrical Manager, as they should be tracking this information or appropriately re-direct. • Facilities Administration staff, they can direct to the appropriate individual or provide the information themselves.
Electricity		• Energy Manager. • Facilities Administration staff as a starting point.
Student Commuting		• Parking department may be able to provide permit information. Keep in mind collecting personal information is not required, which may make collection easier. It will be useful to determine if parking passes provide address and/or postal code which may be helpful to determine commuting distances. • Parking information may be funneled to Corporate Research and Reporting, if the institution has a similar department. If so, they may be able to provide support organizing the data.
Faculty/Employee Commuting		• Similar to Student Commuting, begin with Parking or Corporate Research and Reporting.
Business Travel		• Begin with Payroll, they will most likely either have the information required or be able to guide you to another department. • Another area where Corporate Research and Reporting can provide support. • Be prepared for little information to be provided on air travel, train, and public transport.
Landfill		• Facilities and/or Sustainability Office. • Manager of Building Maintenance and/or Grounds if no Sustainability Office is present.
Paper		• Internal print shop. Be sure to specify the type of paper. • Marketing.

Other academic programming (where equipment/materials are not owned by the institution)		• For a specific course reach out to the instructor. If looking for an entire program, start with that Program Coordinator.

Step 3: Identify Data Type, Units, and Emission Factors

In order to communicate effectively with the individuals identified in Step 2 it is important to understand the type(s) of information needed and associated units. Use the table below for guidance; it includes emission factor values and location within the National Inventory Report (NIR), notes, and any formulas to help describe how to calculate total consumption before moving forward and calculating emissions or inputting into an excel or software.

Activity	Data Type	Data Units Required	Emissions Factor Value[1]	Emissions Factor Location	Notes	Formula
Natural Gas	Consumption*	m^3 of natural gas	CO_2: 1,888 g/m^3 CH_4: 0.037 g/m^3 N_2O: 0.035 g/m^3	NIR Part 2 Table A6-1 for CO_2 Table A6-2 for CH_4 and N_2O	As it is readily available and easy to access, natural gas consumption continues to be the primary way to calculate emissions from natural gas.	None
Generator and other Fuel	Consumption or Price**	m^3 of gas^ Litres of liquefied gas^ Total value of fuel	Dependent on fuel type.	NIR Part 2 Table A6-3 for propane, ethane, butane Table A6-4 for refine petroleum products	As it is readily available and easy to access, consumption data continues to be the primary way to calculate emissions from other gases and liquefied gas. In rare instances, value of fuel may be only data available.	Extrapolate from Price: total value of fuel/ average price of fuel for time period*** = Approximate litres of fuel consumed
Fleet Fuel	Consumption, Price, or Distance	Litres of fuel consumed^ Amount spent on fuel Kilometers driven	Only under rare circumstances will values other than those for "Tier 2 Light – Duty Gasoline Vehicles" be used.	NIR Part 2 Table A6-12	None	Extrapolate from Price: total value of fuel/ average price of fuel per litre*** = total litres purchased Extrapolate from Distance: total kilometers driven/ approximate fuel efficiency of vehicle type

Electricity	Consumption	kWh	40 g CO_2e/kWh	NIR Part 3 Table A13-7 Row title: "Consumption Intensity (g CO_2eq/kWh)"	Utilities, specifically electricity, are well tracked and easy to access.	None
Commuting						
Vehicle	Distance	See formula	Only under rare circumstances will values other than those for Tier 2 Light – Duty Gasoline Vehicles be used.	NIR Part 2 Table A6-12	The most accurate emissions data will come from litres of fuel purchased, because the amount of emissions contained within a litre of fuel is known. Unfortunately, this is not applicable to non-institution owned vehicles, as this assumes all purchased fuel is for institution purposes; this is not true for vehicles owned by students and staff. In this case, the best option is to determine emissions from commuting with non-institution owned vehicles is by distance travelled. If access to certain pieces of information is not available, assumptions and reasoning are necessary. If information on make and model of vehicles is available it is possible, but time consuming, to identify fuel efficiencies for each vehicle. This information is available through the manufacturer (will need to assume highway or side street efficiency). If not possible, will need to assume percent or cars that are small, medium, etc. and apply general fuel efficiencies.	Extrapolate from distance (round trip): (Distance from start point to end point x 2) x Number of days on campus = total kilometres driven per vehicle

Public transport (bus)	Average distance data	See formula	Identify fuel specific to bus type.	NIR Part 2 Table A6-12	Similar to vehicle commuting, but bus information should be on a per passenger basis. Again this information can be gathered by survey and extrapolated.	Extrapolate from distance (one round trip): [(Distance from Start terminal to End terminal x 2) / estimated number of individuals on bus] x number of individuals from post-secondary institution taking bus.
Public Transport (train)	Average distance data	See formula	Identify fuel specific to train.	Part 2 Table A6-12	Emissions from train are measured on a per passenger basis. Do not forget to account for round trip, if applicable. The formula can also be altered to reflect the number of days the same route is taken; the presented formula is for a single day, simply multiple by total number of days.	Extrapolate from distance (one round trip): [(Distance from Start terminal to End terminal x 2) / estimated number of individuals on train] x number of individuals from post-secondary institution taking train.
Air	Average distance data	See formula	Specific to fuel and plane type	NIR Part 2 Table A6-12	Emissions from air are measured on a per passenger basis. More accurate detail can be provided by knowing type of plane.	Extrapolate from distance (one round trip): [(Distance from Start Airport to End Airport x2) / estimated number of individuals on plane] x number of individuals from post-secondary institution.
Landfill	Consumption	Tonnes, kilograms, or pounds of waste.	No standard emissions factor from the NIR.	Many organizations use the Waste Reduction Model Version 14 (WARM) for emissions from waste estimates.	Accurate emissions factors for waste can be difficult to obtain due to a number of factors such as composition of waste, amount of organic material, and moisture level.	None

Paper	Consumption	Pounds, reams, cases of paper	No standard emissions factor from the NIR.	Waste Reduction Model Version 14 (WARM) None	None	None

Notes:
*Consumption: Data required is based on how much of that activity's unit was used in the specified period. This is ideal information to gather.
**Price: Data required is based on dollar amount spent on the activity, allowing total consumption to be estimated based on average price of the activity.
Distance: Data required is a specific distance travelled that will help calculate emissions.
*** Average fuel price for gasoline can be found on Statistics Canada (1-2 month lag) and Natural Resources Canada.
^ If multiple options given, symbol indicates ideal data type.

Step 4: Collect Data

Outreach for data collection can now begin. Use the "Greenhouse Gas Data Request Sample Email" document as a template for sending emails to identified individuals. To provide additional context for those who may not be familiar with a greenhouse gas inventory, an attachment similar to the document entitled "Greenhouse Gas Inventory Fact Sheet" can be created and sent along with the email.

The goal is to create as little work for the person/people with the required data as possible; this may mean delegating time to cleaning up and organizing data.

Step 5: Input Data

With all data collected, it is now time to aggregate and calculate. This may be as simple as sending data to consultants for analysis. However, if this option is not available the Campus Carbon Management Initiative recommends the use of the University of New Hampshire's SIMAP campus carbon software, see the document entitled "Software Recommendation: Greenhouse Gas Accounting in Post-Secondary Institutions" for additional information. If manual calculation is the chosen method, refer to "Sample Greenhouse Gas Calculation" for support if this is a new undertaking.

Potential Challenges

- Lack of tracking of certain key areas.
- Difficulty receiving responses from individuals with necessary data.
- Disorganized data that requires additional time to organize.

Conclusion

Completing a greenhouse gas inventory will be a new exercise for many institutions. The information provided above aims to reduce frustration and build confidence around understanding the required elements of an inventory, and how to complete an accurate inventory that will ensure the baseline and future work is consistent.

[1] Environment and Climate Change Canada. (2018). National Inventory Report 1990-2016: Greenhouse Gas Sources and Sinks in Canada. Accessed from https://unfccc.int/documents/65715