

Environmental Protection Agency Carbon Footprint Calculator



SAMPLE ONLY

This tutorial and spreadsheet will enable you to calculate and document the emissions and carbon footprint of an organization using recognized GHG accounting standards.



Version Control

Version Control and document history: [Ver. 1 Date: 1st Feb 2022]

2022 – Summary of modifications made: [Version 1 completed. Version No: v.1.]

Syllabus

Calculating Emissions	3
Using the Carbon Calculator Spreadsheet	3
Scope 1 Direct Emissions	6
Stationary Combustion	7
Mobile Source Emissions	7
Refrigeration and Air Conditioning Leakage	9
Fire Suppression Systems.....	10
Purchased Gases	10
Waste Gases.....	11
Scope 2 Emissions	12
Purchases of Electricity	12
Purchases of Steam or Heat.....	13
Scope 3 Indirect Sources	14
Employee Business Travel.....	14
Employee Commuting.....	15
Product Transport	16
Waste	17
Purchased Offsets	18
Summary	19

Calculating Emissions

In order to effectively calculate emissions we should have knowledge of:

- # SAMPLE ONLY
- the GHG accounting standard or protocol with information on the sector, sources, and processes that it covers;
 - the approaches needed for determining CO₂e e.g., direct measurement, vehicle mileage, etc.;
 - collecting activity data and selecting their appropriate emission factors;
 - the likely emissions sources and the scopes they fall under;
 - other information such as quality control practices.



Calculations are based on the data available for different business activities. Most actions and decisions a company makes can cause carbon. A more comprehensive and exact data collection will provide a more accurate calculation.

Using the Carbon Calculator Spreadsheet

There are different calculation tools available and you can choose one that suits your organization. The one covered in this tutorial is based on the GHG emission estimates from the United States Environmental Protection Authority (EPA). It is designed to be a simplified calculation tool to help organizations estimate and inventory their annual greenhouse gas (GHG) emissions.

The calculator will determine the direct and indirect emissions from all sources at a company when activity data are entered into the various sections of the workbook for one annual period.



Download the EPA calculator spreadsheet by clicking here.

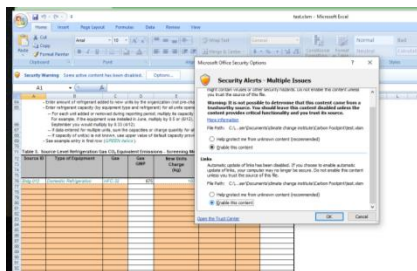
https://www.climatechange.org.au/pdf/EPA_GHG.xlsm

SAMPLE ONLY

The calculator is an Excel workbook separated into the following sections:

- Introduction to the Calculator
- Boundary Questions
- Summary of Organization's Emissions
- Data entry and calculation for scope 1 emission sources - Stationary Combustion, Mobile Sources, Refrigeration and Air Conditioning Leakage, Fire Suppression Systems, Purchased Gases and Waste Gases
- Data entry and calculation for scope 2 emissions sources - Purchases of Electricity, Purchases of Steam or Heat
- Data entry and calculation for scope 3 emissions sources - Employee Business Travel, Employee Commuting, Product Transport, Waste
- Purchased Offsets
- Unit Conversions
- Heat Content
- Emission Factors
- Help Sheets

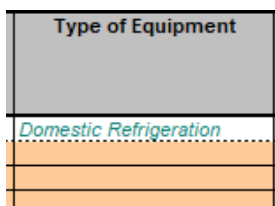
Once you have downloaded the spreadsheet, you can then open it and begin entering your data.



❖ Click on Enable macros – you may get an error message saying that some links can't be updated which you can disregard.

SAMPLE ONLY

Data collected by the organization for each emission source can be entered into the orange boxes within the Calculator.



Blue and green summary boxes represent the scope 1 & 2 and scope 3 portions of the organization GHG inventory, respectively.

<i>Reductions</i>	
Offsets	0
Net Scope 1 and 2 Location-Based Emissions	0
Net Scope 1 and 2 Market-Based Emissions	0

❖ Click on the Summary tab and fill in your company details

Totals are calculated in metric tons of CO₂ equivalent (CO₂e) on the Summary sheet tab.

When entering data, pay attention to units (e.g., cubic feet, gallons). The units from the data collected must match the units in the Calculator for that data requirement. You can readily convert from metric.

For some sources, the Calculator provides several options for calculating emissions, based on data availability. Make sure to read the instructions at the top of each section in the Calculator before entering the data. Remember to enter data covering a full year.

17 **Calculator Guidance - Important Information**

18 (A) Navigate to the data entry sheets using the drop down menu in the dark grey cell below and then clicking on the "Go To Data Entry Sheet" button. On the data entry sheets enter data in ORANGE cells only.

19 (B) This Calculator has several "Tool Sheets" with useful reference data such as unit conversions, heat contents, and emission factors. Click on the buttons below to go to the appropriate Tool Sheet.

20 (C) Data must be entered in the units specified on the data entry sheets. Use the "Unit Conversions" or "Heat Content" sheets if unit conversion is necessary prior to entering data into the Calculator.

Introduction Summary Boundary Questions Stationary Combustion Mobile Sources Refrigeration and AC Fire Suppression Purchased

❖ Click on the Introduction Tab on the bottom L/H side of the screen and read the notes.

The questions below refer to scope 3 emissions sources and offsets. If you answer "yes" you may choose whether or not to include these emissions sources in your inventory. Use the corresponding sheet to enter data.

Business Travel	Yes or No?
Do your employees travel for business using transportation other than owned or leased vehicles (e.g., commercial airline flights, rental cars, trains)?	?
Employee Commuting	
Do your employees commute to work in personal vehicles or use public transportation?	?
Product Transport	
Do you hire another company to transport products or other materials to or from your facilities?	?
Waste Generation/Offset	
Do you generate waste that is disposed in a facility owned by another organization?	?
Do you purchase green gas offsets?	?

SAMPLE ONLY

Introduction Summary Boundary Questions Stationary Combustion Mobile Sources Refig

❖ Click on the Boundary Tab and answer the questions relating to operational boundaries.

Scope 1 Direct Emissions

These occur from sources that are owned or controlled by the organization. Examples include boilers used to heat buildings, refrigerant leakage from air conditioners, or travel in a fleet vehicle. Scope 1 sources may also include leased vehicles or equipment for which the organization pays the fuel bills or can access the fuel use data. Within the Calculator, sources are categorized into six types of scope 1 sources: stationary combustion, mobile sources, refrigeration and air conditioning equipment, fire suppression equipment, purchased gases, and waste gases. While most companies will have at least some scope 1 emission sources, it is possible for an office-based organization to have few or none.

(A) Enter annual data for each vehicle or group of vehicles (grouped by vehicle type, vehicle year, and fuel type) in ORANGE cells in Table 1. Example entry is shown in first row (color: orange). Only enter **electricity** sourced at/used by your organization on this sheet. All other vehicle use such as employee commuting or business travel is considered a scope 3 emissions source and should be reported in the corresponding scope 3 sheets.

- Select "On-Road" or "Non-Road" from drop down box to determine the Vehicle Types available
- Select "Vehicle Type" from drop down box (closest type available)
- Enter "Fuel Usage" in appropriate units (units appear when vehicle type is selected)
- If mileage or fuel usage is unknown, estimate using appropriate fuel economy values (see Reference Table below)
- Vehicle year and miles traveled are not necessary for non-road equipment.

(B) When using biofuels, typically the biofuel (biodiesel or ethanol) is mixed with a petroleum fuel (diesel or gasoline) for use in vehicles. Enter the biodiesel and ethanol percentages of the fuel if known, or leave default values.

Biodiesel Percent: %
 Ethanol Percent: %

(C) Biomass CO₂ emissions from biodiesel and ethanol are not reported in the total emissions, but are reported separately at the bottom of the sheet.

Table 1: Mobile Source Fuel Combustion and Miles Traveled

Source ID	Source Description	On-Road or Non-Road?	Vehicle Type	Vehicle Year	Fuel Usage	Units	Miles Traveled
Page: 1/1	H2 Fuel	Non-Road	Ships and Boats - Diesel	1990	500 gal		3,872
	Gas	OnRoad	Ships and Boats - Gasoline (2 stroke)				

Introduction Summary Boundary Questions Stationary Combustion **Mobile Sources** Refrigeration and AC Fee Suppression Purchased

❖ Click on the Mobile Sources tab.

On-Road or Non-Road?	Vehicle Type	Vehicle Year
NonRoad	Ships and Boats - Diesel	1990
OnRoad	Ships and Boats - Gasoline (2 stroke)	
	Passenger Cars - Gasoline	
	Light-Duty Trucks - Gasoline	
	Heavy-Duty Vehicles - Gasoline	
	Motorcycles - Gasoline	
	Passenger Cars - Diesel	
	Light-Duty Trucks - Diesel	
	Medium- and Heavy-Duty Vehicles - Diesel	
	Light-Duty Cars - Methanol	

❖ You have to type in the value 'OnRoad' or 'NonRoad' for the calculation to work

Determine the types of vehicles, types and amount of fuel, and the miles driven for each vehicle or vehicle type. Data sources vary, but fuel usage is often determined from fuel receipts or purchase records, and mileage can be determined from vehicle records. Mileage or fuel use can also be estimated based on vehicle fuel economy from the manufacturer or www.fuelcalculator.gov if the other data sources are not readily available.

Enter the data into the appropriate orange colored boxes of the Calculator section titled Mobile Sources. If the organization owns or leases biofuel or ethanol vehicles, the percentage of biologically-based fuel should be entered into the boxes provided; default values are available if needed. Once the data are entered into the Calculator, the CO₂e emissions are calculated and summarized in the blue colored box.

Refrigeration and Air Conditioning Leakage

Refrigeration and Air Conditioning (AC) Equipment sources can vary in size based on the type of organization. They are often small sources for office-based organizations.

Most businesses will not use this tab. If you are running air-conditioning, then the emissions are accounted for through your electricity account.

Refrigeration and AC

Emissions from refrigeration and AC devices in facilities or vehicles are caused by the leakage of chemicals with global warming impact during use, maintenance, and/or disposal of the device. For example, a small office building may have one rooftop air conditioning unit while a grocery store chain may have several rooftop air conditioning units per store as well as a multitude of other refrigeration equipment.

Choose one of three different calculation methods available in the Refrigeration and AC section of the Calculator. The types of refrigerants along with the data needs for each method are listed in the Calculator. Data for these sources are often collected from maintenance and inspection records, work orders, or invoices from contractors that service this equipment.

Refrigerants not included on the list may be chemicals that do not need to be included in the inventory. For example, ozone depleting substances, such as chlorofluorocarbons (CFCs) or Freon and hydrochlorofluorocarbons (HCFCs), are regulated internationally and are typically excluded from a GHG inventory or reported as a memo item.

Enter the data into the appropriate orange colored boxes of the Calculator section titled Refrigeration and AC. Once the data are entered into the Calculator, the CO₂e emissions are calculated and summarized in the blue colored box.

Fire Suppression Systems

Fire Suppression emission sources can range in scale from a small portable fire extinguisher to a large-scale fire suppression system for an office building or warehouse. The emissions are caused by chemicals (e.g., HFCs, CO₂) emitted from fire suppression devices during use, maintenance, and disposal.

Fire Suppression

SAMPLE ONLY

Choose one of three different calculation methods available in the Fire Suppression section of the Calculator. In each method, choose the types of fire suppression gases used and then gather the corresponding emissions data. Data for these sources are often collected from maintenance and inspection records, work orders, or invoices from contractors that service this equipment.

Enter the data into the appropriate orange colored boxes of the Calculator section titled Fire Suppression. Once the data are entered into the Calculator, the CO₂e emissions are calculated and summarized in the blue colored box.

Purchased Gases

Industrial gases are sometimes used in processes such as manufacturing, testing, or laboratory uses. For example, CO₂ gas is often used in welding operations.

Purchased Gases

These gases are typically released to the atmosphere after use. Any releases of the seven major greenhouse gases (CO₂, CH₄, N₂O, PFCs, HFCs, SF₆, and NF₃) must be included in the GHG inventory. Ozone depleting substances, such as CFCs and HCFCs, are regulated internationally and are typically excluded from a GHG inventory or reported as a memo item.

Determine if CO₂, CH₄, N₂O, PFCs, HFCs, SF₆, and NF₃ are used in processes such as those mentioned above. If so, collect the mass of gas purchased. If data are not available in mass units, the user may need to convert from volume to mass using the density of the specific gas.

Enter the data into the appropriate orange colored boxes of the Calculator section titled Purchased Gases. Once the data are entered into the Calculator, the CO₂e emissions are calculated and summarized in the blue colored box.

Waste Gases

Some operations, such as printing operations or paint booths, emit organic compounds. In some cases, these waste gas streams are combusted with a flare or thermal oxidizer. This combustion results in CO₂ emissions that should be included in GHG inventories. These are uncommon sources for most office-based organizations.



Collect information about the volume of waste gas that was combusted. Because of the variable composition of waste gas streams, the user will also need to find out what chemicals are present in the waste gas stream and the quantity of each chemical. Please note that oxidation factor and gas density should be also collected if practicable; however, default values can be used if needed. The oxidation factor accounts for the amount of carbon in the fuel that is converted to CO₂ during combustion.

Enter the data into the appropriate orange colored boxes of the Calculator section titled Waste Gases. Once the data are entered into the Calculator, the CO₂e emissions are calculated and summarized in the blue colored box. Scope 2 Indirect Emissions Scope 2 indirect emissions are emissions from energy (e.g., electricity, heat, and steam) consumed in owned or controlled equipment or operations but generated by another entity other than the reporting organization.

For example, although the reporting organization may own equipment that consumes electricity, like office computers and copy machines, a power plant operated by a third-party is likely burning fuel to generate the electricity that the reporting organization is using to operate its equipment. Therefore, the indirect emissions of the reporting organization are the direct emissions of the third-party that operates the power plant. For many companies, purchased electricity is the largest source of indirect GHG emissions and the most significant opportunity to reduce those emissions.

Scope 2 Emissions

The Calculator section on scope 2 emissions has two types:

- purchases of electricity; and

purchases of steam.

Guidance released in early 2015 requires organizations to report two scope 2 totals: location-based and market-based. This is referred to as dual reporting. The organization should quantify and report both totals in its GHG inventory.

The location-based method considers average emission factors for the electricity grids that provide electricity. The market based method considers contractual arrangements under which the organization procures power from specific sources, such as renewable energy. For contractual arrangements to be included as market-based emissions, they must meet the quality criteria outlined in the guidance document and also on the “Market-Based Method Help sheet” in the Calculator.

Market-based emission factors can be entered based on the organization’s contractual arrangements and on the availability of factors. The Calculator is set up such that if no market-based factors are entered, it will calculate them as equal to location-based, based on the requirements of the scope 2 guidance. More information is available in the Greenhouse Gas Inventory Guidance document, Indirect Emissions from Purchased Electricity.

Purchases of Electricity

GHGs are emitted when fossil fuels are combusted to generate electricity. Companies account for their responsibility for these emissions by reporting them as scope 2 emissions.

Tip: Enter electricity usage by location and then look up the eGRID subregion for each location.
If you purchase renewable energy that is less than 100% of your site's electricity, see the example in the market-based method Help sheet.

Table 1. Total Amount of Electricity Purchased by eGRID Subregion

Source ID	Source Description	Source Area (sq ft)	eGRID Subregion where electricity is consumed	Electricity Purchased (kWh)	Market-Based						Location-Based		
					Emission Factors			Emissions			Emissions		
					CO ₂ Emissions (lb/MWh)	CH ₄ Emissions (lb/MWh)	N ₂ O Emissions (lb/MWh)	CO ₂ Emissions (lb)	CH ₄ Emissions (lb)	N ₂ O Emissions (lb)	CO ₂ Emissions (lb)	CH ₄ Emissions (lb)	N ₂ O Emissions (lb)
Bldg-012	East Power Plant	12,517	HRS (MCC Miscellaneous)	200,000	0	0	0	0.0	0.0	0.0	207,120.0	28.8	1.4
Mgmt	Office	2,000	ERCOT (ERCOT All)	300,000	0.121	0.045	0.056	36.3	13.5	16.8	260,580.0	17.1	2.4
					<center factor>	<center factor>	<center factor>						
					<center factor>	<center factor>	<center factor>						
					<center factor>	<center factor>	<center factor>						
					<center factor>	<center factor>	<center factor>						
					<center factor>	<center factor>	<center factor>						
					<center factor>	<center factor>	<center factor>						
					<center factor>	<center factor>	<center factor>						
					<center factor>	<center factor>	<center factor>						
					<center factor>	<center factor>	<center factor>						

4 | Introduction | Summary | Boundary Questions | Stationary Combustion | Mobile Sources | Refrigeration and AC | Fire Suppression | Purchased Gases | Waste Gases | Electricity | ST

❖ [Click on the Electricity Tab](#)

You electricity bill may show the amount of CO₂e that you have consumed, in which case you can skip this step and simply type in the amount in the Summary tab (you will have to temporarily un-protect the worksheet).

SAMPLE ONLY
Electricity tariffs may often have a mixture of renewable and fossil fuel generation. So if you apply a fossil fuel emission factor to the entire kWh amount that you purchased your emission calculations will be too high. You must get the accurate data from your electricity supplier. The location based approach, therefore, need not be used.

Collect electricity purchase information in units of kWh. It may be for each facility in the company. organization's best data source is typically its electricity bill or invoice. Data on any contractual arrangements, such as utility green power products, should also be collected. This should include the units (e.g., kWh), as well as the relevant emission factors. These purchases should be separately accounted for using the appropriate market-based emissions factor. See help sheet in the Calculator for how to enter these data.

Enter the data into the appropriate orange and yellow colored boxes of the Calculator section title Electricity (Table 1) if market-based factors are applicable. Once the data are entered into the Calculator, the CO₂e emissions are calculated and summarized in the blue colored boxes at the bottom of the sheet.

Purchases of Steam or Heat

Similar to electricity production, GHGs are emitted when fossil fuels are combusted to generate steam or heat. If the reporting organization purchases steam or heat, the emissions are accounted for as scope 2 emissions.

Determine the amount of steam purchased, the types of fuel that the steam supplier uses to generate the steam, and either the emission factors provided by the steam supplier or the boiler efficiency. If values for boiler efficiency are unavailable, a default of 80 percent is provided in the Calculator.

Enter the data into the appropriate orange and yellow colored boxes (Table 1) of the Calculator section titled Steam. Once the data are entered into the Calculator, the CO₂e emissions are calculated and summarized in the blue colored boxes at the bottom of the sheet.

Summary

Once you have finished collecting and entering the data you should check your figures, particularly to ensure that the units of measurement that you chose are correct for the applied emission factor.

Summary of Organization's Emissions:

Scope 1 Emissions		
Go To Sheet	Stationary Combustion	0 CO ₂ e (Metric tons)
Go To Sheet	Mobile Sources	0 CO ₂ e (Metric tons)
Go To Sheet	Refrigeration / AC Equipment Use	0 CO ₂ e (Metric tons)
Go To Sheet	Fire Suppression	0 CO ₂ e (Metric tons)
Go To Sheet	Purchased Gases	0 CO ₂ e (Metric tons)
Location-Based Scope 2 Emissions		
Go To Sheet	Purchased and Consumed Electricity	0 CO ₂ e (Metric tons)
Go To Sheet	Purchased and Consumed Steam	0 CO ₂ e (Metric tons)
Market-Based Scope 2 Emissions		
Go To Sheet	Purchased and Consumed Electricity	0 CO ₂ e (Metric tons)
Go To Sheet	Purchased and Consumed Steam	0 CO ₂ e (Metric tons)
Total organization Emissions		
	Total Scope 1 & Location-Based Scope 2	0 CO ₂ e (Metric tons)
	Total Scope 1 & Market-Based Scope 2	0 CO ₂ e (Metric tons)
Scope 3 Emissions		
Go To Sheet	Employee Business Travel	0 CO ₂ e (Metric tons)
Go To Sheet	Employee Commuting	0 CO ₂ e (Metric tons)
Go To Sheet	Product Transport	0 CO ₂ e (Metric tons)
Go To Sheet	Waste	0 CO ₂ e (Metric tons)
Required Supplemental Information		
Go To Sheet	Biomass CO ₂ Emissions from Stationary Sources	0 CO ₂ e (Metric tons)
Go To Sheet	Biomass CO ₂ Emissions from Mobile Sources	0 CO ₂ e (Metric tons)
	Total Emissions	0 CO ₂ e (Metric tons)
Productions		
	Offsets	0 CO ₂ e (Metric tons)

Introduction Summary Boundary Questions Stationary Combustion

❖ Click on the Summary tab to see your results

You should now create your organization's GHG statement and a template can be found on our website. Keep copies of your files including the Excel spreadsheet calculator file, a copy of the corporate protocol and any emails or notes of meetings relating to your GHG survey and accounting methods.

There may be some emissions that you need to account for, such as by employees working from home. This is more difficult to estimate. You can find average estimates put out the UNFCC carbon calculator which are perfectly acceptable. There is also guidance on the EPA website.

By estimating your organization's carbon footprint you have taken most important step towards carbon neutrality. This gives you the data required to effectively conduct an ongoing an emission reduction program. It also allows you to know how many tonnes of carbon offsets are required for your organization to become climate neutral and gain registration through the Climate Change Institute.

