The UNFCC Carbon Footprint Calculator

United Nations Framework
Convention on Climate Change

SAMPLE - 0NLY

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

Climate Change Institute
climatechange.org.au

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Calculating Emissions

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

- the GHG accounting standard or protocol with information on the sector, sources, and processes that it covers;
- the approaches needed for determining CO_2e 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 best suits your organization. The UNFCC calculator is based on the GHG emission estimates from the **United Nations Framework Convention on Climate Change**. 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 UNFCC calculator by clicking here.

https://www.climatechange.org.au/pdf/UNFCC_GHG.xlsx

Once you have downloaded the spreadsheet, you can then open it. The calculator is an Excel workbook separated into the following sections:

These are the UNFCC GHG Conversion Factors for Company Reporting, approved by the UK and other governments. These emission factors are suitable for use by organizations of all sizes. The scope of the factors is defined such that it is relevant to emissions reporting.

Each worksheet presents the emission factors for a single type of emissions-releasing activity (for example, using electricity or driving a passenger vehicle).

These activities are categorized into three scopes. Each activity is listed as either: Scope 1, Scope 2 or Scope 3.

- Scope 1 (direct emissions) emissions are those from activities owned or controlled by your organization. Examples of Scope 1 emissions include emissions from combustion in owned or controlled boilers, furnaces and vehicles; and emissions from chemical production in owned or controlled process equipment.
- Scope 2 (energy indirect) emissions are those released into the atmosphere that are associated with your consumption of purchased electricity, heat, steam and cooling. These indirect emissions are a consequence of your organisation's energy use, but occur at sources you do not own or control.
- Scope 3 (other indirect) emissions are a consequence of your actions that occur at sources you do not own or control and are not classed as Scope 2 emissions. Examples of Scope 3 emissions are business travel by means not owned or controlled by your organisation, waste disposal, materials or fuels your organisation purchases. Deciding if emissions from a vehicle, office or factory that you use are Scope 1 or Scope 3 may depend on how you define your operational boundaries. Scope 3 emissions can be from activities that are upstream or downstream of your organisation. More information on Scope 3 and other aspects of reporting can be found in the Greenhouse Gas Protocol Corporate Standard.

The worksheets provide the following information:

- Guidance on calculating emissions from this activity
- An example of how to calculate emissions from this activity
- The emission factors for this activity
- Frequently asked questions
- How do I calculate my GHG emissions for a particular activity?

Navigate to the sheet relating to the activity that you wish to calculate emissions for. Read the guidance and then collect or estimate activity data for your organisation (for example, the amount of electricity used or distance travelled).

To get the amount of CO2e emissions, we multiply the activity data (such as vehicle usage) by the relevant (emission) conversion factor. This gives an estimate of the GHG emissions for that activity. GHG emissions = activity data x emission conversion factor.

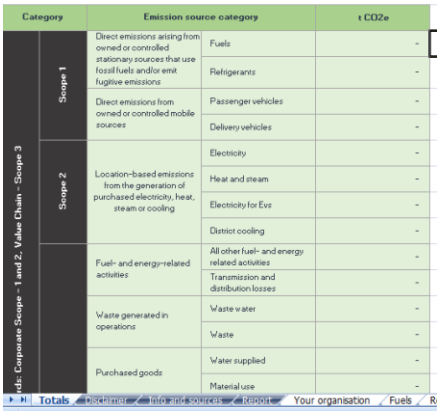
There are seven main GHGs that contribute to climate change, as covered by the Kyoto Protocol: carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulfur hexafluoride (SF6) and nitrogen trifluoride (NF3). Different activities emit different gases and you should report on the Kyoto Protocol GHG gases produced by your particular activities.

All conversion factors presented here are in units of 'kilograms of carbon dioxide equivalent of Y per X' (kg CO2e of Y per X), where Y is the gas emitted and X is the unit activity. CO2e is the universal unit of measurement to indicate the global warming potential (GWP) of GHGs, expressed in terms of the GWP of one unit of carbon dioxide.

The GWPs used in the calculation of CO2e are based on the Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report (AR4) over a 100-year period (this is a requirement for inventory/national reporting purposes).

As a minimum, for each activity there is a factor that can be used to calculate emissions of all relevant GHGs combined (kg CO2e per unit activity). Additionally, for many activities, this factor is then split into separate factors for each gas (that is, kg CO2e of CO2/CH4/N2O per unit activity) which sum to the total

Load the spreadsheet.

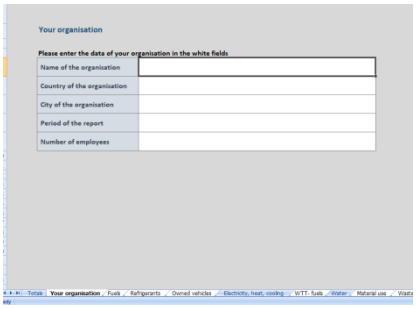


Category		Emission source category		t CO2e
Corporate Scope - 1 and 2, Value Chain - Scope 3	Scope 1	Direct emissions arising from owned or controlled stationary sources that use fossil fuels and/or emit fugitive emissions	Fuels	-
			Refrigerants	-
		Direct emissions from owned or controlled mobile sources	Passenger vehicles	-
			Delivery vehicles	-
	Scope 2	Location-based emissions from the generation of purchased electricity, heat, steam or cooling	Electricity	-
			Heat and steam	-
			Electricity for EVs	-
			District cooling	-
		Fuel- and energy-related activities	All other fuel- and energy related activities	-
			Transmission and distribution losses	-
		Waste generated in operations	Waste water	-
			Waste	-
		Purchased goods	Water supplied	-
			Material use	-

Totals | Refrigerants | Fuels | Your organisation | Fuels

- **Click on Totals tab. This is where you we see the results.**

Data collected by the organization for each emission source can be entered into each worksheet.



Your organisation

Please enter the data of your organisation in the white fields

Name of the organisation	
Country of the organisation	
City of the organisation	
Period of the report	
Number of employees	

- **Click on the Your Organization tab and fill in your details**

This includes your organization's name and location.

Scope 1 Direct Emissions

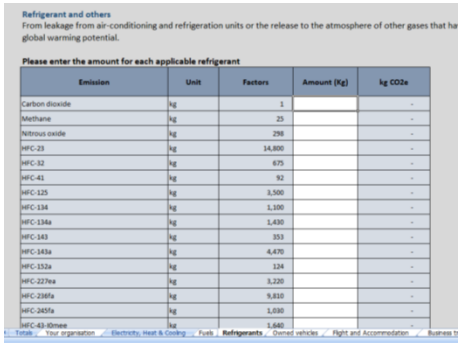
These occur from sources that are owned or controlled by the organization. Examples include boilers used to heat buildings, refrigerant leakage from air conditioners, or travel in a fleet vehicle. Scope 1 sources may also include leased vehicles or equipment for which the organization pays the fuel bills or can access the fuel use data.

Fuel and Refrigerants

Most businesses will not use these two tabs

If you are running electric air-conditioning, then the emissions are accounted for through your electricity account. These combustion emission sources are called stationary sources. They combust fuel, such as a natural gas hot water heater for an office building or an oil burning boiler. Emissions result from the actual combustion of the fuels to produce useful products, like heat and hot water. 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.

If you use gas to heat your premises you should be able to get the amount of gas in MMBtu units from your bill, otherwise you can use other unit. To account for these sources, collect information about the type of fuel used and the quantity of fuel combusted at each facility. Sources of data can vary, but the data are often provided by the utility company that supplies the fuel to the organization. A monthly natural gas bill, for example, can be used to provide information regarding how much natural gas was purchased for the previous billing cycle.



Refrigerant and others

From leakage from air-conditioning and refrigeration units or the release to the atmosphere of other gases that ha
global warming potential.

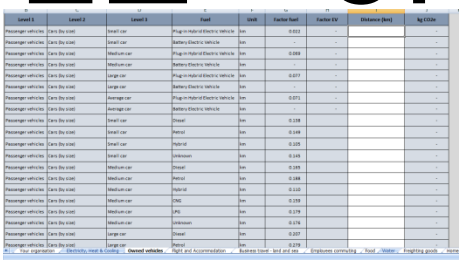
Please enter the amount for each applicable refrigerant

Emission	Unit	Factors	Amount (Kg)	kg CO2e
Carbon dioxide	kg	1		-
Methane	kg	25		-
Nitrous oxide	kg	298		-
HFC-23	kg	14,800		-
HFC-32	kg	675		-
HFC-41	kg	92		-
HFC-125	kg	3,500		-
HFC-134	kg	1,100		-
HFC-134a	kg	1,430		-
HFC-143	kg	353		-
HFC-143a	kg	4,470		-
HFC-152a	kg	124		-
HFC-227ea	kg	3,220		-
HFC-236fa	kg	9,810		-
HFC-245fa	kg	1,030		-
HFC-43-10mee	kg	1,640		-

Totals | Your organisation | Electricity, Heat & Cooling | Fuels | Refrigerants | Owned vehicles | Flight and Accommodation | Business t

Owned Vehicles

Mobile sources, like organization-owned cars and heavy-duty vehicles, generate emissions by burning fuel. The fuel usage for any vehicle that is included within the organization's selected boundary approach should be reported in this section as direct emissions.



❖ **Click on the Owned Vehicles tab.**

Determine the types of vehicles, types and amount of fuel, and the distance 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.

Enter the data into the appropriate cell. The distance must be in kilometers. To convert from miles to kilometers, simply multiply the number of miles by 1.609. The CO2e emissions are calculated and summarized in the Totals tab.

Scope 2 Emissions

The Calculator section on scope 2 emissions has two types:

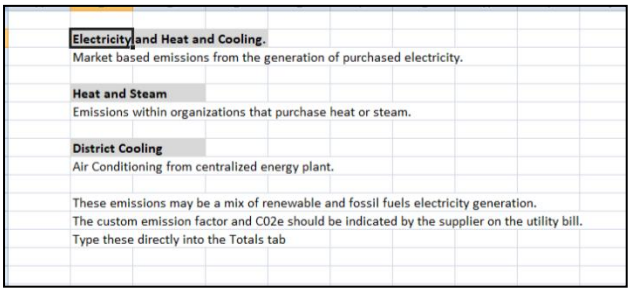
- purchases of electricity; and
- purchases of steam.

A location-based method considers average emission factors for the electricity grids that provide electricity. The market based method is more accurate as it considers contractual arrangements under which the organization procures power from specific sources, such as renewable energy.

Market-based emission factors can be entered based on the organization's contractual arrangements and on the availability of factors. The energy supplier will provide you with the exact amount of CO2e emitted from electricity and steam that you have purchased.

Purchases of Electricity, Heat and Cooling

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.



- **Click on the Electricity, Heat and Cooling tab.**

Electricity tariffs now often have a mixture renewable and fossil fuel generation. Many electricity bills will show the amount of C02e that you have consumed, in which case you can type in the amount in the Total tab. So if you apply a fossil fuel emission factor the entire KWh amount that you purchased your emission calculations will be too high. You must get the accurate data from your electricity supplier.

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 factors. See help sheet in the Calculator for how to enter these data.

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.

Scope 3 Indirect Sources

Scope 3 indirect emissions are a consequence of the activities of an organization but are not owned or controlled by the organization sources, such as employee commuting and transporting products to market using contract carriers.

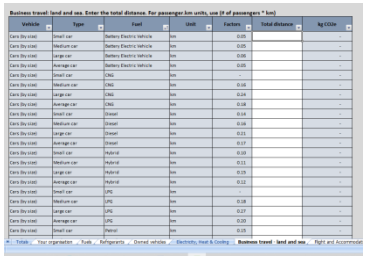
Some companies don't report scope 3 emission sources but estimating these emissions provides a more complete picture of the organization's climate change impact and offers the organization more opportunities to reduce emissions.

Scope 3 emissions most commonly reported are:

- employee business travel;
- employee commuting;
- waste; and
- product transport.

Employee Business Travel

Employee business travel emissions differ from the required mobile source emission reporting in that they account for employee business travel in vehicles not owned or leased by the organization, such as taxis, trains, commercial airplanes, and personal vehicles used for sales.

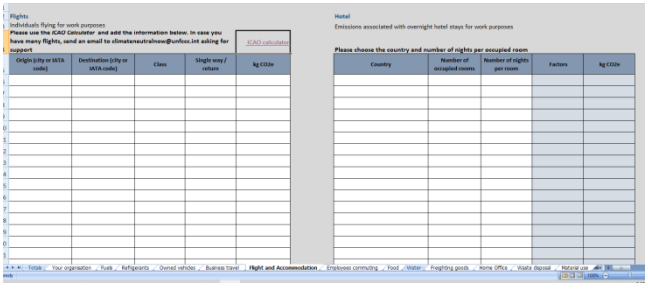


❖ **Click on the Business Travel tab**

Input the information about the employees' business travel methods. For travelers that use a personal vehicle, choose the vehicle type from the Calculator, and collect data for the vehicle miles during the reporting period. For rail, bus, and air travel, the mode of travel should be selected from the Calculator options and an estimate of the passenger mileage data provided for each.

Enter the data into the appropriate orange colored boxes (Tables 1-3) of the Calculator section titled Business Travel. Once the data are entered into the Calculator, the CO2e emissions are calculated and summarized in the green colored box.

Flight and Accommodation

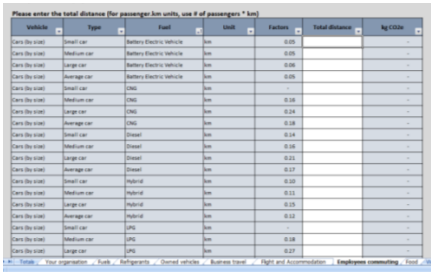


❖ **Click on the Flight and Accommodation tab**

Here you fill out your flight details and then click on the link that takes you to the ICAO website. Here you will get accurate emissions for the flights. The hotel section allows you to account for emissions in occupied rooms.

Employee Commuting

Employee commuting emissions differ from the required mobile source emission reporting in that they account for employee travel to and from work in vehicles not owned or leased by the organization, including personal vehicles, buses, and trains.

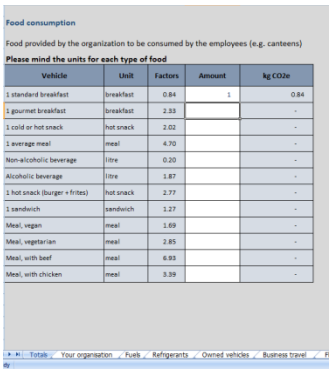


❖ **Click on the Employees Commuting tab**

Collect information about each employee's commuting method. For commuters that use a personal vehicle, the appropriate vehicle type should be selected from the Calculator and data collected for the vehicle miles during the reporting period. For rail, bus, and air travel, the mode of transport should be selected from the Calculator options and an estimate of the passenger mileage data provided for each.

Food

This is for food provided by the organization which is consumer by the employees.



Food consumption

Food provided by the organization to be consumed by the employees (e.g. canteens)

Please mind the units for each type of food

Vehicle	Unit	Factors	Amount	kg CO2e
1 standard breakfast	breakfast	0.84	1	0.84
1 gourmet breakfast	breakfast	2.33		-
1 cold or hot snack	hot snack	2.02		-
1 average meal	meal	4.70		-
Non-alcoholic beverage	litre	0.20		-
Alcoholic beverage	litre	1.87		-
1 hot snack (burger + frites)	hot snack	2.77		-
1 sandwich	sandwich	1.27		-
Meal, vegan	meal	1.69		-
Meal, vegetarian	meal	2.85		-
Meal, with beef	meal	6.93		-
Meal, with chicken	meal	3.39		-

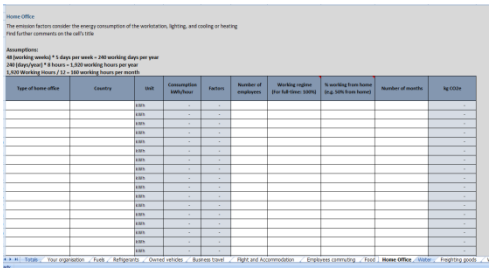
Totals | Your organisation | Fuels | Refrigerants | Owned vehicles | Business travel

❖ **Click on the food tab**

Input the data which could be for catering or from an office canteen.

Home Office

This is for the emissions by employees working from home.



Home Office

The emission factors consider the energy consumption of the workstation, lighting, and cooling or heating

Find further comments on the cell's title

Assumptions:

48 (working weeks) * 5 days per week = 240 working days per year

240 (days/year) * 8 hours = 1,920 working hours per year

1,920 Working Hours / 12 = 160 working hours per month

Type of home office	Country	Unit	Consumption kWh/hour	Factors	Number of employees	Working regime (For full-time: 100%)	% working from home (e.g. 50% from home)	Number of months	kg CO2e
		kWh	-	-					-
		kWh	-	-					-
		kWh	-	-					-
		kWh	-	-					-
		kWh	-	-					-
		kWh	-	-					-
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		kWh	-	-					-
		kWh	-	-					-

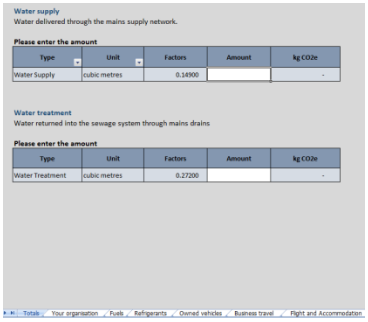
Totals | Your organisation | Fuels | Refrigerants | Owned vehicles | Business travel | Flight and Accommodation | Employees commuting | Food | Home Office | Water | Freighting goods

❖ **Click on the Home Office tab**

It accounts for workstations, lighting, cooling and heating.

Water

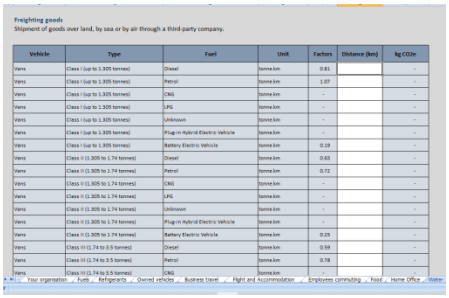
The accounts for the emissions from supply of water and return through the sewerage netork.



❖ Click on the Water tab

Freighting Goods

Emissions from product transport include product and material shipments by vehicles not owned or leased by the organization. For example, the organization could hire another company to transport product from the manufacturing location to distribution centers or final markets. (Note: if an organization owns or leases the trucks or other transport vehicles, these would be part of its scope 1 mobile source emissions.) Another example of product transport is paying a courier to transport documents from one office to another.



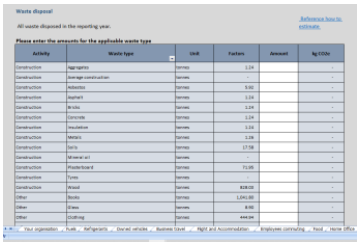
❖ **Click on the Freighting Goods tab**

Collect information about shipment methods (eg. vans, HGV, rail). For road shipments, the user may enter data based on vehicle mileage or ton-miles of product transported. Select the type of vehicle and enter the total distance for that vehicle type.

The distance must be in kilometers. To convert from miles to kilometers, simply multiply the number of miles by 1.609. Once the data are entered into the Calculator, the CO2e emissions are calculated and summarized in the Totals tab.

Waste Disposal

Scope 3 emissions from waste include the disposal and treatment of waste generated. These emission factors align with the requirements of the GHG Protocol Scope 3 Standard.



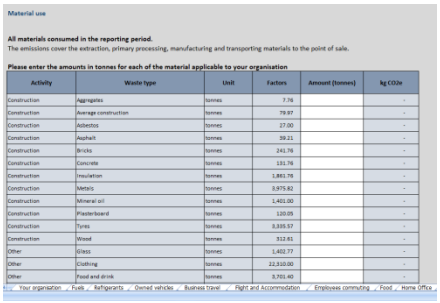
❖ **Click on the Waste Disposal tab**

The emission factors do not include any avoided emissions impact from any of the disposal methods. All the factors presented include transportation emissions, which are optional in the Scope 3 Calculation Guidance, with an assumed average distance traveled to the processing facility. AR4 GWPs are used to convert all waste emission factors into CO2e.

Collect information on the amount of weight disposed at your facilities, by the type of waste (plastics, paper, etc.) and disposal method (recycling, incineration, etc.). After the data have been collected, enter the data into the appropriate cell. Once the data is entered into the Calculator, the CO2e emissions are calculated and summarized in the Totals tab.

Material Use

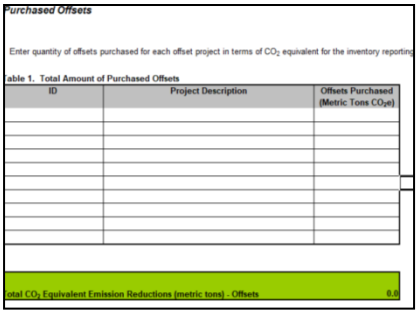
This accounts for emissions from extracting, primary processing, manufacturing and transporting materials to your site.



❖ **Click on the Material Use tab**

Purchased Offsets

Offsets are project-based direct emission reductions and/or removals that occur outside the organizational boundary of the reporting organization.



Offsets must be quantified using an approved methodology. Offsets can be purchased from the Climate Change Institute at the right market price to offset emissions from scope 1, scope 2, and scope 3 emission sources*. Renewable energy certificates are not project offsets and do not convey a direct emissions reduction to their owner*. RECs are measured in MWh units, whereas project offsets are measured in tons of direct emission reductions. You purchase a quantity of offsets purchased in metric tons CO2e for each offset project.

The rest of the tabs on the spreadsheet contain reference data and disclaimer.

Totals

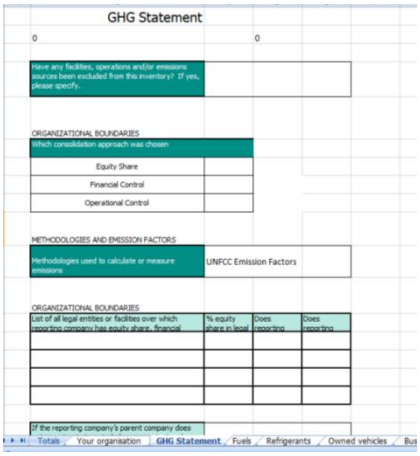
Once you have finished collecting and entering the data you should check your figures, particularly to ensure that the units of measurement that you chose are correct for the applied emission factor.

❖ **Click on the Totals tab to see your results**

Keep copies of your files including the excel spreadsheet file, a copy of the corporate protocol and any emails or notes of meetings relating to your GHG survey and accounting methods.

GHG Emission Statement

You can fill out the rest of the details for your organization's GHG statement.



❖ **Click on the GHG Statement tab**

This will display total emission data for each scope. Fill out relevant details about your company such as whether using financial or operation control.

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.