GreenStep
SOLUTIONS

GHG Accounting Workbook

2021

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List of Acronyms

CH_4	Methane
CO_2	Carbon Dioxide
CO_2e	Carbon Dioxide Equivalent
CSA	Canadian Standards Association
GHG	Greenhouse Gas
GJ	Gigajoule
GWP	Global Warming Potential
HFCs	Hydrofluorocarbons
ISO	International Organization for Standardization
kg	Kilogram
km	Kilometre
kWh	Kilowatt Hour
L	Litre
N_2O	Nitrous Oxide
PFCs	Perfluorocarbons
pkm	Passenger Kilometre
SF_6	Sulphur Hexafluoride
tCO_2e	Metric Tonnes of Carbon Dioxide Equivalent
WBCSD	World Business Council for Sustainable Development
WRI	World Resources Institute

INTRODUCTION

Congratulations! You have decided to measure your carbon footprint. This workbook will help you understand the risks and opportunities in terms of carbon management, how and why it's important to measure your carbon footprint accurately, how to set reduction targets and how to make the right investments in carbon reduction behaviours and technologies. Fill in the exercises as you go and enjoy the process. Here we go!

1. The Carbon Challenge

1.1 Risks for Your Business

As you may know, businesses are facing significantly increased pressure from stakeholders to reduce their contribution to climate change. That pressure is likely to come from a combination of consumer demand for environmentally responsible businesses, as well as the reality or potential for government and industry regulation. All businesses will likely experience a greater degree of scrutiny over their carbon footprint and may need to demonstrate environmentally responsible practices to remain competitive in the marketplace. Failure to demonstrate environmental responsibility is increasingly perceived as a source of risk by investors and customers.

Exercise 1

Take a few minutes to brainstorm all the risks that could be associated with climate change that apply to your organization. These could be PR, financial, operational risks, etc. When you have identified the risks, write them down in Table 1:

Table 1: Risks to Your Organization

1.2 Opportunities for Your Business

These days, “going green” is essential to any business strategy. It’s not just about caring for the environment, although that certainly ranks high among considerations. It’s also about good business sense. While business owners recognize their effect on the environment is important, the impact on their bottom line appears to be the greatest motivator. It’s pretty simple: Using less energy and fewer resources saves money. Companies that take proactive measures to minimize climate change impacts could create market opportunities and new revenue streams above and beyond generating cost savings and satisfying regulatory mandates.

Exercise 2

Take a few minutes to brainstorm all the **opportunities** associated with reducing your organization’s contribution to climate change. When you have identified the opportunities, write them down in Table 2:

Table 2: Opportunities for Your Organization

2. Measuring Your Carbon Footprint

2.1 Greenhouse Gas Accounting and Reporting Standards

GHG Definition/Overview

Greenhouse gases (GHGs) occur naturally in the atmosphere and are fundamental to regulating Earth's liveable temperature. For the sake of GHG accounting and reporting, there are 6 common GHGs.

Carbon dioxide (CO_2) is often considered the most important of the GHGs due to its high level of atmospheric concentration and integral role in absorbing infrared radiation. Due to this high concentration, CO_2 in the atmosphere is measured in parts per million (ppm). Methane (CH_4) and nitrous oxide (N_2O) are equally important as CO_2 on a molecular level but are considered somewhat less important in the overall progression of climate change because of lower atmospheric concentration levels. Because of these lower concentrations, CH_4 and N_2O are measured in parts per billion (ppb).

Hydrofluorocarbons (HFCs), Perfluorocarbons (PFCs), and Sulphur hexafluoride (SF_6) are also considered among the 6 common GHGs, although their atmospheric concentrations are lower than both CH_4 and N_2O. Atmospheric concentrations of HFCs, PFCs, and SF_6 are measured in parts per trillion (ppt).

Carbon Equivalents

The global warming impacts of some GHGs are more than others. The following are GWPs for the 6 common GHGs (values adapted from the IPCC Sixth Assessment Report, 2021):

- CO_2 = 1 GWP
- CH_4 = 27.9 GWP
- N_2O = 273 GWP
- HFCs = variable GWPs
- PFCs = variable GWPs
- SF_6 = 25,200 GWP

When calculating GHGs, a single metric combining the common GHGs with their respective GWP is used. This metric is referred to as carbon dioxide equivalent (CO_2e).

Example of CO2e calculation:

In 2007, Bob's Bakery measured its GHG emissions for the first time since the business started. Bob determined that the restaurant emitted 125 tonnes of CO_2, 2 tonnes of CH_4, and 0.1 tonnes of N_2O, for a total of 127.1 tonnes. Shortly after completing the inventory, Bob realized that he forgot to include the GWP for each GHG. Bob revised his inventory to account for the GWPs (Table 3):

Table 3: Global Warming Potentials of Bob's Bakery

Greenhouse Gas	2007 Emissions	GWP	Tonnes of CO_2e
CO_2	125	1	125
CH_4	2	27.9	55.8
N_2O	0.1	273	27.3
Total	127.1	-	208.1

GHG Accounting Definition and Accounting Standards

GHG accounting describes the way to measure emissions from an organization. Accounting guidelines of the Greenhouse Gas Protocol published by the World Resources Institute (WRI) and the World Business Council for Sustainable Development (WBCSD) is the international accounting tool most widely used by government and business leaders to understand, quantify, and manage GHG emissions.

Other accounting guidelines exist in addition to the Greenhouse Gas Protocol, such as the Canadian Standards Association (CSA) International Organization for Standardization (ISO) 14064. Although there are differences between standards, most GHG emission reports prepared by organizations that meet ISO standards would also meet Greenhouse Gas Protocol standards, and vice versa.

Table 4 compares the main steps in the accounting guidelines published by the CSA ISO 14064 and WRI/WBCSD Greenhouse Gas Protocol. For further information on GHG accounting principles, see Appendix 1 for a list of resources.

Table 4: Comparison of GHG Accounting Guidelines

Major Steps	CSA ISO 14064	WRI/WBCSD GHG Protocol
Understanding Uses for GHG Inventory	Introduction	Business Goals and Inventory Design
GHG Accounting Principles	Principles	Accounting and Reporting Principles
Parts of Organization to Include	Organizational Boundaries	Setting Organizational Boundaries
Activities to Include	Operational Boundaries	Setting Operational Boundaries
Emissions Sources to Include	Quantification of GHG Emissions and Removals	Identifying and Calculating Emissions
Comparing Performance Over Time	Base Year GHG Inventory	Tracking Emissions Over Time
Quality Management System	GHG Inventory Quality Management	Managing Inventory Quality
Reporting	Reporting of GHG	Reporting of GHG Emissions
Verification	Organization's Role in Verification	Verification of GHG Emissions

2.2 Greenhouse Gas Accounting Methods

The organizational boundary determines which business entities and facilities will be included in your GHG inventory. If your organization has more than one location, you must decide if you will calculate GHG emissions generated at each location, or only at the main headquarters. Keep in mind that the more entities/facilities included in your organizational boundary, the more chances there will likely be to reduce emissions. In setting the

organizational boundary, 2 consolidation approaches are used to report GHG emissions: control and equity share.

The Control Approach

In the control approach, an organization accounts for 100% of the GHG emissions from operations that it controls. The organization does not account for GHG emissions from operations that it may own an interest in but has no control over. Control is defined as either financial or operational.

Financial Control: An organization has financial control of the operation if it can direct financial and operating policies to gain economic benefits from the operation's activities.

Example of Financial Control (Control Approach):

- Delicious Foods Inc. owns 50% of Bob's Bakery
- If Delicious Foods Inc. determines the financial policies (eg. operating budgets, salary structures) of Bob's Bakery and stands to gain economic benefits from its activities, then Delicious Foods Inc. has financial control over Bob's Bakery
- Under the financial control approach, Delicious Foods Inc. should report 100% of GHG emissions for Bob's Bakery
    - Bob's Bakery should not report GHG emissions from the bakery
- If Bob's Bakery is given the ability to set financial policies, then the bakery would have to report 100% of the GHG emissions
- Under this scenario, Delicious Foods Inc. would not report emissions from its operations

Operational Control: An organization has operational control of the operation if it has the authority to implement operating policies at the operation.

Example of Operational Control (Control Approach):

- Delicious Foods Inc. owns 50% of Bob's Bakery but allows Bob's Bakery to continue to run day to day operations

- If Delicious Foods Inc. allows Bob's Bakery to determine operational policies (i.e. hours of operations, types of ingredients used, etc), then Bob's Bakery has operational control
- Under the operational control approach, Bob's Bakery should report 100% of GHG emissions for the bakery
    - Delicious Foods Inc. should not report GHG emissions from Bob's Bakery
- If Delicious Foods Inc. eventually takes control over the operational policies of Bob's Bakery, then Delicious Foods Inc. would have to report 100% of the GHG emissions
    - In this case, Bob's Bakery would not report emissions from its operations

Equity Share Approach

In the equity share approach, an organization accounts for GHG emissions from operations based on its share of equity in the operation. Equity reflects economic interest, which is the extent of rights a company has to the risks and rewards flowing from an operation. The equity share will typically be the same as the percentage of ownership in the operation.

Example of Equity Share Approach:

- Delicious Foods Inc. owns 50% of Bob's Bakery but does not have financial or operational control
    - Bob's Bakery owns the other 50% of the bakery
- Under the equity approach, Delicious Foods Inc. should report 50% of GHG emissions associated with Bob's Bakery
    - Bob's Bakery should report the remaining 50% of GHG emissions
- Note that, under the operational control approach, Delicious Foods Inc. would not have to report any GHG emissions from Bob's Bakery as it does not have operational control

Reporting Year and Base Year

A meaningful comparison of emissions over time requires that your organization select a performance standard against which current emissions can be compared. This is referred to as a base year.

A base year can be either the calendar year or your organization's fiscal year. No matter which base year is selected, the same dates should be used for future GHG emissions inventories to ensure consistency. The importance of this consistency is highlighted when tracking progress towards a GHG reductions target and comparing it to the base year.

The base year can be a single year or an average of annual emissions over several consecutive years, the latter of which may smooth out any yearly fluctuations in GHG emissions that would make a single base year unrepresentative of the organization's typical emissions.

As your organization changes over time, your base year may have to be recalculated. Recalculations should be done to reflect structural changes such as mergers, acquisitions, and outsourcing activities, as well as changes in methodologies used to calculate GHG emissions inventories.

2.3 Selecting Emissions Sources that Apply to Your Organization

After setting your organizational boundary, you must set the operational boundary for your business. Note that the operational boundary is different from the organizational boundary, in that you are deciding which emissions sources within the organization that you will track and try to reduce. The easiest way to do this is to consider all the ways that emissions are generated in your organization – i.e. heating, cooling, business travel, employee commuting – before selecting the emissions sources that you will report.

Direct versus Indirect Emissions

GHG emissions are produced by a variety of business activities – from heating and lighting the office to travelling to meetings. As defined by the Greenhouse Gas Protocol, GHGs from a business are categorized into direct and indirect emissions.

Direct emissions are generated from sources that your organization owns, such as company cars, or a natural gas boiler in the basement. For accounting purposes, direct

emissions are called Scope 1 emissions. Accounting for and reporting on direct emissions is typically required for all GHG emissions reporting standards.

Indirect emissions are emissions that result from your organization's activities but the sources are owned or controlled by a separate organization. For example, your organization may own its computers and photocopiers but the electricity used to power the office equipment is generated by the utility company.

Indirect emissions are divided into Scope 2 and Scope 3 emissions. Scope 2 emissions are from the use of purchased electricity, steam, or heat. Scope 3 emissions include all other indirect emissions, such as business travel in non-company-owned vehicles, employee commuting, paper usage, waste disposal, and outsourced activities. Accounting for Scope 2 emissions is required under the GHG Protocol, while accounting for Scope 3 emissions is not mandatory but encouraged.

Example of Direct versus Indirect Emissions:

Table 5 contains direct and indirect emissions sources for Bob's Bakery. The emissions sources are further broken down into Scopes 1 thru 3.

Table 5: Direct Versus Indirect Emissions Sources for Bob's Bakery

Direct Emissions	**Indirect Emissions**	
Scope 1	Scope 2	Scope 3
Natural Gas Boiler	Purchased Electricity	Office Paper
Propane		Garbage
Gasoline for Leased Car		Business Travel – Air
Diesel Fuel for Delivery Truck		Business Travel – Ground
		Employee Commuting

Exercise 3

Take a few minutes to brainstorm emissions sources that apply to your organization. When you have identified the sources, write them down in Table 6:

Table 6: Direct Versus Indirect Emissions Sources for Your Organization

Direct Emissions	**Indirect Emissions**	
Scope 1	Scope 2	Scope 3

2.4 Identifying Data You Need to Collect and How to Track it Over Time

Two kinds of data will need to be collected in order to calculate your organization's GHG emissions: Activity Data and Emissions Factors.

Activity Data

Activity data quantifies an activity – i.e. electricity consumed, business trips taken, amount of waste produced – in units that will be used to calculate GHG emissions (e.g., kWh, km, kg, etc.). One approach to collecting activity data is to keep the information in a central location, similar to bookkeeping for accounting purposes. The following examples illustrate activities in their corresponding units:

- Litres of gasoline

- Kilowatt hours of electricity
- Business air miles/kilometers traveled
- Cubic meters of natural gas

When collecting activity data, it is important to keep in mind that your organization may not be responsible for all of the emissions from a particular activity. Example 1 illustrates a scenario where office space is shared between 2 companies, which must be accounted for in the calculation. Similarly, example 2 demonstrates that carpooling results in reduced emissions for the activity of employee commuting because there is more than 1 person in the vehicle. Not accounting for these percentages can result in overestimated GHG emissions.

Emissions Factors

Emissions factors are values that convert activity data to GHG emissions. Emissions factors are source-specific, meaning that there will be a specific emissions factor for the particular activity you are trying to convert to GHG emissions. For example, an emissions factor for electricity produced by burning coal will be higher than an emissions factor for electricity produced by a hydro-electric dam. It is important to get the most detailed activity data possible to ensure that the proper emissions factor is used.

Emissions factors are published by various institutions, including local, provincial/state, and federal governments, and intergovernmental agencies. Emissions factors are frequently updated, so it is important to stay current and use the most recent values. See Appendix 1 for a list or resources that provide emissions factors

Equation to Calculate GHG Emissions:

Activity Data x Emissions Factors = GHG Emissions

Examples of GHG Emissions Calculations

Example 1: Scope 1 – Natural Gas

Bob's Bakery shares an office building in Vancouver with Ace Accountants and uses 60% of the total square footage of the building. In order to calculate the GHG inventory for Bob's

Bakery, Bob asked the property manager for utility bills for the last 12 months. The property manager provided the utility bills to Bob, but was unable to split up the natural gas used between the bakery and the accounting firm.

For the calendar year ending December 31, 2010, Bob's Bakery and Ace Accountants consumed a total of 2,400 gigajoules (GJs) of natural gas. Using an emissions factor of 56 kilograms (kg) of CO_2e per Gigajoule (GJ) of natural gas obtained from the Intergovernmental Panel on Climate Change (2006), Bob determined that the bakery alone generated the following tonnes of CO_2e (tCO_2e) from natural gas consumption for the 2010 calendar year:

$$2,400GJ \times 60\% \times \frac{56kg\ CO_2e}{GJ} = 80,640kg\ CO_2e \times \frac{1\ metric\ tonne}{1{,}000kg} = 80.64tCO_2e$$

Example 2: Scope 3 – Employee Commuting

It is the end of the 2010 fiscal year and Bob's Bakery is calculating its yearly GHG emissions for the Vancouver store. Bob includes employee commuting in his inventory for the bakery. Bob has a total of 3 employees (including himself) that commute to work 5 days a week in a private vehicle. Tom and Mary operate their own vehicle to and from work for a daily roundtrip total of 20 and 25 kilometres (km), respectively. Bob and his wife, who works across the street from the bakery, commute together in the same vehicle for a roundtrip distance of 30 km every day. All 3 vehicles produce a similar amount of GHGs that result in 0.2 kg of CO_2e per km driven (rounded emissions factors obtained from the 2005 GHG Protocol Mobile Guide and 2008 Climate Registry's General Reporting Protocol). Note that all Bob's Bakery employees receive 15 days of vacation a year. The total rounded emissions from employee commuting for the year were:

Tom

$$\frac{20km}{day} \times \frac{245\ business\ days}{year} = 4,900km \times \frac{0.2kg\ CO_2e}{km} \times \frac{1\ metric\ tonne}{1{,}000kg} = 0.980tCO_2e$$

Mary

$$\frac{25km}{day} \times \frac{245\ business\ days}{year} = 6,125km \times \frac{0.2kg\ CO_2e}{km} \times \frac{1\ metric\ tonne}{1{,}000kg} = 1.225tCO_2e$$

Bob

$$\frac{30km}{day} \times \frac{245\ business\ days}{year} = 7,350km \times \frac{0.2kg\ CO_2e}{km} \times \frac{1\ metric\ tonne}{1{,}000kg} = 1.47tCO_2e$$

$$1.47tCO_2e \times \frac{1(Bob)}{2(Bob+MsBob)} = 0.735tCO_2e$$

Total GHG Emissions from Employee Commuting to/from Bob's Bakery:

Tom (0.980) + Mary (1.225) + Bob (0.735) = **2.94 tCO_2e**

Exercise 4

Bob's Bakery has asked you to help calculate the remaining 2010 GHG emissions for his Vancouver store. In addition to natural gas consumption (80.6 tCO_2e, see Example 1) and employee commuting (2.9 tCO_2e, see Example 2), Bob would like you to calculate emissions from the missing sources in the following table. Keep in mind that, similar to natural gas, a single total for purchased electricity is reported for both Bob's Bakery and Ace Accountants and the 60% of square footage used by Bob's Bakery also applies to electricity.

Tip: Remember that GHG emissions are reported in tonnes and must be converted from kg to tonnes of CO_2e

Table 7: GHG Emissions Calculations for Bob's Bakery

Emissions Source	Activity Data	Emissions Factor	tCO_2e
Scope 1			
Natural Gas	2,400 GJs	56 kg of CO_2e per GJ[1]	**80.64**
Diesel for Delivery Truck	1,800 L of Diesel	2.7 kg of CO_2e per L[2]	
Scope 2			
Purchased Electricity	1,900,000 kWh	0.02 kg CO_2e per kWh[2]	
Scope 3			
Employee Commuting	14,700 km	0.2 kg of CO_2e per km[3]	**2.94**
Business Air Travel	4,000 pkm on short-haul flights	0.1 kg of CO_2e per pkm[4]	
Office Paper	80 reams (0% recycled)	6.5 kg of CO_2e per ream[5]	
Total GHG Emissions			

[1]- 2006 Intergovernmental Panel on Climate Change
[2]- 1990 – 2008 Environment Canada National Inventory Report
[3]- 2005 GHG Protocol Mobile Guide and 2008 Climate Registry's General Reporting Protocol
[4]- 2009 Guidelines to Department for Environment, Food and Rural Affairs (DEFRA)/Department of Energy and Climate Change (DECC)'s GHG Conversion Factors for Company Reporting
[5]- Environmental Defence Paper Task Force

2.5 Standards for Reporting Emissions

It is important to share your GHG emissions, as well as the progress you've made in reducing emissions, internally and externally by preparing a GHG emissions report. A credible report presents information that is accurate, complete, consistent, and transparent. Although various reporting standards exist, an emissions report in accordance with the GHG Protocol requires the following information:

- **Description of the Organizational and Inventory Boundary**
    - Outline of the organizational boundary
        - Control versus equity share approach
    - Outline of operational boundaries
        - Direct and indirect emissions
        - Activities classified under Scopes 1, 2, 3
    - Reporting Period
- **Information on Emissions**
    - Total Scope 1 and Scope 2 emissions in tonnes
        - Scope 3 is optional
    - Separate emissions data for each Scope
    - Separate emissions data for all GHGs in both tonnes and in tonnes of CO_2e
    - Base year and emissions performance over time
    - Information about base year emissions recalculations
    - Methodologies used to calculate GHG emissions
        - Reference or link to calculation tools used
    - Specific exclusions of sources not included in the inventory

It is important to note that GHG emissions are reported in tonnes of CO_2e. Conversion factors may be required to convert any other units – i.e. kilograms, short tons, etc. – to tonnes.

In compliance with GHG Protocol reporting standards, a publicly released GHG emissions report may include additional information. This information is available in Chapter 9 of the GHG Protocol.

2.6 Verification of the Process

Verification, or auditing, is an independent evaluation of the degree to which the information reported by your organization is accurate and complete, and how the information conforms to pre-established GHG accounting and reporting principles. Verification can occur internally, by an employee that is independent of the GHG accounting and reporting process, or externally by a third-party verifier that is likely to add credibility to your GHG emissions inventory.

Materiality is important to verification. A material error results in a reported quantity that is significantly different from its true value and information is considered material if its inclusion or exclusion influences decisions or actions. Although materiality is a value judgement, a rule of thumb suggests that an error is materially misleading if its value is greater than 5% of the total GHG inventory. However, the rule of thumb is likely to vary among external verifiers.

Example of Materiality using Bob's Bakery:

- In 2010, Bob's Bakery calculated its GHG emissions to be 112.16 tCO2e and released a report to stakeholders
- After releasing the report, Bob asked his wife to do an independent verification of the bakery's inventory
    - The information in the report is used for business planning and Bob wanted to ensure that the information was accurate and complete
- While auditing the utility bills used by Bob to calculate how much natural gas was consumed in 2010, Bob's wife noticed that Bob made a summation error

    - The actual total natural gas consumed by Bob's Bakery and Ace Accountants was 1,900 GJs, not 2,400 GJs

- Thus, natural gas used only by Bob's Bakery was 1,140 GJs (1,900 GJs x 60%) not 1,440 GJs as originally calculated by Bob

    - This error resulted in a revised footprint for the 2010 fiscal year that was 17.6% lower than originally calculated (95.36 tCO_2e compared to 112.16 tCO_2e, respectively)

- Since the error was greater than 5%, and considered materially misleading (remember that Bob uses the information in the report to make planning decisions for his business), Bob's Bakery revised its 2010 GHG inventory with the correct information and released a revised report.

3. Planning the Future

3.1 Setting GHG Reduction Targets

Once a GHG footprint has been developed for your organization, you can establish reduction targets to reduce emissions. Setting a GHG reduction target identifies an amount of emissions your organization commits to eliminating from its inventory. In setting your GHG reduction targets, 3 pieces of information must be identified:

- **Establish a base year**
    - The base year acts as a benchmark against which to compare current emissions
    - Base years are described in further detail in Section 2.2
    - i.e. Bob's Bakery began calculating GHG emissions in 2007 and uses this as its base year
- **Determine a target year**
    - A target year is the year by which your organization will achieve the GHG reductions
    - The target year sets an achievable goal with a defined date
    - i.e. Bob's Bakery aspires to reduce GHG emissions by 2025
- **Set a reduction target**
    - The reduction target is the amount of GHG emissions that your organization commits to reducing
    - i.e. Bob's Bakery set a reduction target of 20% below 2007 emissions by 2010

Your organization has the option of establishing 2 types of emissions reductions targets: absolute and intensity.

Absolute Targets

Absolute emissions reductions targets are concrete goals to eliminate emissions. The targets do not take factors such as organizational growth into consideration.

Advantages of absolute targets include specific reductions in GHGs emitted to the atmosphere and a commitment to reduce GHGs by a specified amount. Disadvantages of absolute targets is that they do not allow comparisons of GHG intensity, may be difficult to achieve if an organization grows, and often require potentially complex recalculations for the base year.

Example of Absolute Target:

- For its 2007 base year, Bob's Bakery reported total emissions of 1,400 tCO_2e
- Bob's Bakery committed to an absolute emissions reduction target of 20% below its 2007 base year emissions by 2010
- In 2010, Bob's Bakery calculated yearly emissions of 1,040 tCO_2e
- Bob's Bakery reduced emissions by nearly 26% between 2007 and 2010 (1,400 tCO_2e - 1,040 tCO_2e ÷ 1,400 tCO_2e)
- Thus, Bob's Bakery successfully achieved, and surpassed its absolute emissions reduction target of 20% between 2007 and 2010

Intensity Targets

Intensity targets are linked to a performance metric of the organization. The targets reduce the ratio of emissions relative to a business metric.

Intensity targets are desirable because they reflect GHG performance independent of organizational growth/decline and usually do not require base year recalculations. However, disadvantages of intensity targets include a potential increase in GHG emissions to the atmosphere and difficulties identifying a common business metric.

Example of Intensity Target:

- Bob's Bakery also set an intensity target to reduce GHG emissions per customer
- In its 2007 base year, Bob's Bakery emitted 1,400 tCO_2e and had 2,000 customers

- This generated 0.7 tCO_2e per customer (1,400 tCO_2e ÷ 2,000 customers)

- In 2010, Bob's Bakery generated a total of 1,040 tCO_2e, but only had 1,300 customers
  - This resulted in 0.8 tCO_2e per customer (1,040 tCO_2e ÷ 1,300 customers)

- So, even though Bob's Bakery reduced absolute emissions from 1,400 tCO_2e in 2007 to 1,040 tCO_2e in 2010, the intensity target increased from 0.7 tCO_2e in 2007 to 0.8 tCO_2e in 2010

Exercise 5

North Shore Heliskiing began calculating its yearly GHG emissions inventory in 1990 and uses that year as its base year. In an effort to reduce its emissions over the long-term, North Shore Heliskiing set both absolute and intensity targets to be achieved by 2000 and 2010:

- Absolute Targets
  - Reduce absolute emissions by 10% between 1990 and 2000
  - Reduce absolute emissions by 15% between 1990 and 2010
- Intensity Targets
  - Reduce emissions per skier between 1990 and 2000
  - Reduce emissions per skier between 1990 and 2010

Using the information in Table 8, determine whether North Shore Heliskiing achieved both its absolute and intensity emissions reduction targets for 2000 and 2010. You can use the last two columns in the table for your calculations

Table 8: Operational Information for North Shore Heliskiing

Year	GHG Emissions (tCO_2e)	Yearly Skiers	% Change in Absolute Emissions	GHG Intensity per Skier
1990	2,400	1,800	-	-
2000	2,200	1,900		

2010	2,000	1,700		

3.2 Developing a Strategy for Meeting Targets

The next step is to plan and implement strategies to reduce your footprint and monitor performance over time. There are typically two strategies to meeting your GHG reduction targets: internal reductions and carbon offsetting. Carbon offsetting is discussed in **Section 3.3**.

Internal reduction strategies can range from simple tasks such as powering down computers and electronics at night to more elaborate initiatives like purchasing high efficiency HVAC technologies. It is often easiest to begin by identifying emissions reduction actions that will provide the most emissions savings at the lowest cost. Yet, no matter the size and scope of the strategy, every effort helps to achieve your company's GHG reduction targets. A complete list of reduction strategies is available in Appendix 2.

Exercise 6

In the table below, identify any GHG reduction strategies that have been implemented by your organization. Compare with the list of possible strategies in Appendix 2. Now, update your current list with any strategies that could be implemented by your organization over the next 1 – 3 years.

Table 9: GHG Reduction Strategies for Your Organization

Office & Building Space (HVAC)	**Fleet Vehicles & Heavy Equipment**	**Lighting & Electricity Consumption**
1.	1.	1.
2.	2.	2.
3.	3.	3.
4.	4.	4.
Computers	Paper Usage	Recycling & Waste
1.	1.	1.

2.	2.	2.
3.	3.	3.
4.	4.	4.
Business Ground Travel	Business Air Travel	Staff Commuting
1.	1.	1.
2.	2.	2.
3.	3.	3.
4.	4.	4.
Couriers	Suppliers and Contractors	General
1.	1.	1.
2.	2.	2.
3.	3.	3.
4.	4.	4.

3.3 Carbon Offsetting and Going Carbon Neutral

What is Carbon Offsetting?

A carbon offset is an emissions reduction credit you can purchase to compensate for GHG emissions. Since you are buying the credit from an independent party, the removal of emissions occurs outside your organization's operations. Purchasing carbon offsets should supplement internal reductions to meet your organization's reduction targets.

Carbon offsets are purchased through certified carbon offset retailers. One tonne of carbon offset equals one tonne of GHGs reduced from high-quality projects like energy efficiency programs or fuel switching systems. For example, an energy efficiency carbon reduction project can be used to balance your emissions from another source, such as a plane trip. The bottom line is that your organization can buy offsets to counteract GHGs that it cannot avoid emitting.

Carbon Neutral

Purchasing carbon offsets allows you to compensate for GHG emissions that cannot be feasibly avoided. Since internal GHG reductions cannot eliminate all of the emissions generated by your organization, carbon offsets are required to further reduce your footprint. By offsetting its entire footprint with carbon credits, your organization can become fully carbon neutral and achieve a net zero carbon footprint.

Example:

- In 2009, Bob's Bakery used internal reduction strategies to reduce emissions
    - The strategies resulted in a decrease in GHG emissions from 1,200 tCO_2e in 2009 to 1,040 tCO_2e in 2010
- After reducing emissions internally, Bob's Bakery decided to offset the remaining emissions and be carbon neutral in 2010
    - Bob contacted Carbon Offset Experts, a local offsetting firm that specializes in credible, local emissions offsets generated from energy efficiency and fuel switching projects
- Carbon Offset Experts charges $20 per tonne of carbon offset
    - At this price, Bob's Bakery spent $20,800 (1,040 tCO_2e x $20 per tonne) to be carbon neutral in 2010
    - Note that, had Bob not reduced emissions from 1,200 tCO_2e in 2009 to 1,040 tCO_2e in 2010, it would have cost the restaurant $24,000 to be carbon neutral

4. Maximizing the ROI of Reducing your Footprint

Once you have your strategy in place and are striving to reach those targets, you will immediately start to see some of the benefits of reducing your GHG footprint. Besides incurring savings on your energy bills and reducing other operational costs, a large return on your investment (ROI) will come in the added value it brings to your brand.

4.1 Doing the Right Thing

It's more important than ever for you to be doing the right thing with your business. Doing the right thing doesn't just mean it's good for your business. It means it's right for your customers, right for your community, right for the environment, right for your own sense of integrity and of course your financial wellbeing.

Consumers are changing. The increasing awareness and concern for the planet is everywhere, but the problems are too big and complex - people struggle to know what to do. Most consumers care, or at least want to know that they are not doing harm. They want to be doing the right thing.

Consumers are paying much more attention to whom they buy from, where their products come from and how much carbon is emitted in the whole process. If you can show that you are making good efforts to reduce your footprint, whether it's changing your light bulbs, buying locally, refusing to use plastic bags, or cycling to work – your customers will appreciate it. You and your competition will be judged on their environmental track record and consumers will vote with their wallets by purchasing from the company with a clear plan to reduce GHG emissions and well-defined measures to minimize the environmental impact of their activities.

Q: As a consumer, what are the things you care about as it relates to your purchasing decisions?

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Q: What do you think your community wants from a business? What would doing the right thing look like to your community?

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4.2 Telling the Story – Keeping it Real

A good marketing strategy today is to tell your customers and prospects who you are and what you are doing in an authentic way. Consumers want to know who you are – really. They don't want a sales pitch or catchy marketing slogan telling them about how "eco" and "green" you are. They want to know the kind of people they're dealing with, what values lie at the core of your business, and what efforts you are making to protect the environment. They want to know what you are doing. They want to know your story.

Once you're on the path to reducing your GHG footprint, you will have begun your story. The story actually starts before then – consumers want to know that you have recognized the need for change and for taking responsibility for your business activities. So tell them the truth. Tell them how bad it is (or was). Tell them where you started and where you're headed. Then tell them your progress, including the hiccups along the way. Show them what your GHG footprint is (or was) and describe what actions you intend to take to reduce it and over what period of time. But whatever you do, don't do any "greenwashing" – always

be authentic. If you exaggerate or misrepresent any of your actions, your customers will feel deceived and will not want to deal with a company that is engaged in what they consider “greenwashing” – whether it’s intentional or otherwise. Your brand value may be greatly diminished and your customers will likely go elsewhere.

Q: What do you want to know about a business or company that you are buying from?

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4.3 Different Strokes for Different Folks

There are different types of consumers out there – each responds differently to varying marketing messages and media. Look carefully at your current customers as well as your ideal target market, to determine what motivates them in their purchasing behaviour, and ensure that you communicate to them in a way that they can relate to and be drawn by. Know who your customers are and tell the story accordingly.

- **Ethical Seekers:** These people actively seek green products and services as a continuation of their lifestyle. There are few of them, but they are vocal and loyal. They want to know all about your business and what you do.
    - Rational, international, interrogative, willing to pay more
- **Switch Off:** This group of people just want to switch off – they don’t want to take responsibility and are unlikely to value your efforts. Your GHG emissions reduction

actions will need to happen behind the scenes and your communication should focus on how it improves their experience of your product or service without costing them an extra cent.

    - Irrelevant, local, cynical, won't pay more

- **Feel Good Factor**: This group is the majority – they are aware of the issues but don't go out of their way to act. They won't seek information, but will respond well to messages that show where they can get a better product or service that happens to be provided by an environmentally conscious company.

    - Emotional, local, simplified, unlikely to pay more

Exercise 7

Do you know your customers? Take a few minutes to brainstorm the characteristics of your major customers and of those who you would like to attract more of. Think about what motivates them in their purchasing behaviour as it relates to the environment or climate change. Using the three types of customers above, write down what you think their emotional drivers are.

Table 10: Who are your customers?

Your customer	**Type of Customer**	**Emotional Drivers**
If different from above, describe the type of customers you would like to have		

4.4 Keep the story simple

Whichever group you are telling, make sure your story is clear and simple. There are too many vague messages out there. You can't do everything right away, so be specific about what you are doing and clearly tell your customers what response or change you are hoping for from them. Don't tell them to "be green". For example: "We have added bike racks to the front of our store which our staff and many customers use – parking is not an issue!"

- Help your customers to feel good – provide options that are "good" choices with positive impacts. For example, if you are a restaurant, explain where you get your food from, how committed that supplier is to good environmental management, or offer "Ocean Wise" menu options.
- Raise awareness and help your customers to do things differently and therefore multiply the positive difference you are making through reducing your own footprint.

Q: What is the simple message you would want to give your ideal customers

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4.5 Why are you telling a story

Faced with a similar product and price, your GHG credentials can give you the edge – with both existing and prospective customers. Your story will assure them that because you care about the environment and society, you also care about your customers and their experience of your business. The work that you are doing will make your current customers feel good about their experience with you and they may tell others who are similarly motivated by environmentally conscious companies and products.

- Reducing GHG emissions doesn't have to be boring! Help your customers to enjoy themselves and to experience hands-on what makes you unique. Get them to participate in some way – doing is more fun than observing.
- Make them feel special. Put your customer at the centre of the experience – what's in it for them? Word your information thinking about how you want your customers to feel, instead of listing your product features and attributes. And remember which type of customer you're telling. If it's the "feel good factor" then talk about sustainability as pampering, as having something unique, about looking after your customer. For example: "Fresh, unadulterated, honest food that will make your stay here even more memorable" is more likely to sell than talking "food miles" and "supporting the local economy".

- Show a personal connection – not a bland corporate directive. Write in the first person. Add a photo of yourself.

Q: As a consumer, if a company tells you what they've been doing to protect the environment or what actions they're taking to reduce their carbon footprint, what does that mean to you? How does it make you feel?

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4.6 Where to Tell the Story

You're actually marketing your business all the time. Wherever you touch your customers and prospects, you have the opportunity to tell your story. It doesn't have to be the whole story, but make sure you tell them what's good about what you do and that you mean it – all the time. Keep the story alive – keep your messages up to date. Don't just tell them about what you did last year, but what actions you took last week, and yesterday.

An obvious place to tell your story is on your website. While it's great to have your environmental policy and green guidelines posted on one of your webpages, it's even better to incorporate your story throughout your site. Use images of before-and-after situations (e.g. volume of garbage behind the store), or pictures of staff in action (e.g. running a community event).

Tell your story on Twitter, Facebook and other social networks to tell others what you are doing. Invite feedback and suggestions. Engage your "friends" and participate in community blogs.

The look and feel of your business, whether retail or corporate, sends a message about whether or not you really care. If you have numbers of walk-in customers, display a page saying "What we have done to reduce our carbon footprint" to show this is an ongoing

day-to-day policy. Have staff/employees talk about your GHG emissions reduction activities on a regular basis.

Q: As a consumer, where would you look to find out more about the product or service, or about the business you're buying from?

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4.6 Not all Stories have to End!

Your story has a beginning and middle, but hopefully it will never end. Your GHG emissions reduction strategy is like a journey – not a destination – and should be ongoing, your targets evolving over time.

Stay in touch with customers – speaking about your latest environmental activity will be more welcomed than a direct marketing message saying "buy from us again". If your customers know you planted trees, tell them how they are growing. If you had pictures from a local school, tell customers how you are now speaking there and how those children are learning from what you have done.

Everything you do along the way is worthy of telling your customers – no matter how small. If you and your business are committed to making a difference and to reducing your GHG footprint, you will find ways to continue to do so, bringing positive change to your staff, customers, friends and neighbours. So we can all live happily ever after!

Exercise 8: Take-away Assignment

What kind of story do you have to tell? Who are you and what are you doing in your business? If you haven't yet started along your GHG emissions reduction journey, where do you think you would go from here? What are the things that are most important to you in

your business around environmental issues? What kind of actions do you want to take and how would you tell your customers?

Table 11: What is your story?

What is really important to you?
What kind of business do you want to be known to be?
What actions are you already taking?
What do you want to do? What will you start doing differently after this workshop?

What do you think you need to achieve it?
Where are you going to tell your story? Be specific

5. Appendix

Appendix 1 – Resources for GHG Accounting

Guidance for Organizations General guides on the emissions sources to include in a GHG inventory and how to report GHG emissions		
Title	**Organization**	**Source**
Climate Registry General Report Protocol Version 3.0	The Climate Registry	Link
Working 9 to 5 on Climate Change: An Office Guide	World Resources Institute (WRI)	Link
Canadian GHG Challenge Registry Guide to Entity & Facility-Based Reporting Version 6.0	Canadian Standards Association and GHG Registries	Link
Small Business User Guide: Guidance on How to Measure and Report Your Greenhouse Gas Emissions	UK Department of Environment, Food, and Rural Affairs (DEFRA)	Link
Guidance on How to Measure and Report Your Greenhouse Gas Emissions	UK Department of Environment, Food, and Rural Affairs (DEFRA)	Link

Emission Factors Information on emissions factors, conversion factors and methodologies required in calculating GHG emissions		
Title	**Organization**	**Source**
2006 IPCC Guidelines for National Greenhouse Gas Inventories	Intergovernmental Panel on Climate Change (IPCC)	Link
National Inventory Report 1990-2019: Greenhouse Gas Sources and Sinks in Canada	Environment Canada	Link
Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2019	United States Environmental Protection Agency (EPA)	Link
Direct Emissions from Mobile Combustion Sources	United States Environmental Protection Agency (EPA)	Link
2021 Government Greenhouse Gas Conversion Factors for Company Reporting June 2021	UK Department of Environment, Food, and Rural Affairs (DEFRA)	Link

National Inventories Overview of emission trends, sources and sectors for Canada, the United States, and the United Kingdom		
Title	**Organization**	**Source**
National Inventory Report 1990-2019: Greenhouse Gas Sources and Sinks in Canada	Environment Canada	Link
Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2019	United States Environmental Protection Agency (EPA)	Link
Greenhouse Gas Inventories for England, Scotland, Wales and Northern Ireland: 1990 - 2015	National Atmospheric Emissions Inventory	Link

Appendix 2 – Reduction Strategies

Office & Building Space (HVAC)

- Lower thermostat/temperature when office and building space is vacant.
- Control office environment with an energy management system.
- Use a third party to examine all energy systems, building management controls and heat recovery, and make recommendations for renovations.
- Install occupancy sensors in washrooms to control exhaust fans.
- Share fuel and electricity data with employees to educate them on energy use and to encourage energy conservation.
- Turn off any equipment at night and at times of low occupancy.

Fleet Vehicles and Heavy Equipment

- Replace fleet vehicles with hybrid equivalents or smaller, more fuel efficient models (if possible).
- Enforce an anti-idling policy in and around the facility.
- Develop an environmental policy for equipment procurement and ensure vehicle purchases meet environmental criteria.
- Conduct regular vehicle maintenance and ensure tires are properly inflated.

Lighting and Electricity Consumption

- Install occupancy sensors in restrooms and common areas.
- Use a third party to examine lighting systems and make recommendations.
- Request that all employees, suppliers, and contractors turn off lights prior to exiting the facility.
- Strategically place stickers on light switches reminding staff to turn off lights when not needed.
- Develop a procurement policy that mandates EnergyStar office equipment.

- Purchase ‘Green Power’ electricity which uses low-impact renewable sources.

Computers

- Create a policy to ensure computers and printers are turned off at night.
- Replace old monitors with LCD monitors.
- Put a policy in place to ensure that all computer and printing equipment purchases are EnergyStar rated.
- Install stickers on monitors reminding staff to turn off monitors, computers and power bars when not in use.
- Where possible, give preference to laptop computers rather than desktop computers, as laptops typically consume less energy.

Paper Usage

- Purchase 100% recycled paper.
- Set printers and computers to default double-sided printing.
- Use an email signature that reads “Please do not print this email” and append it to employee email signatures.
- Look for more opportunities in everyday workload to scan instead of printing or faxing
- Convert internal documentation such as financial statements to Adobe .pdf format instead of printing.
- Ensure all public documents are available online and in Adobe .pdf format.

Recycling & Waste

- Expand the existing recycling program to include more items that typically end up in landfills.
- Compost all organic waste.
- Avoid use of disposable utensils and dishes in favour of re-usable items.

- Provide mugs to employees to limit use of cardboard coffee cups.
- Reduce wastebasket size and increase the number of recycling bins to encourage more recycling/reusing and less waste.

Business Ground Travel

- Consider implementing a program to allow employees to share taxis.
- Encourage mass transit such as bus or train over personal vehicle usage.
- Encourage employees to request hybrid rental cars where possible.

Business Air Travel

- Permit only critical, unavoidable air travel.
- Purchase carbon offsets for all air travel.
- Combine trips that require air travel.
- Increase the usage of video conferencing as an alternative to air travel.

Staff Commuting

- Make it easy for staff to purchase transit passes, such as including payroll deductions to cover payment and photo ID on site.
- Offer staff incentives to purchase transit passes, such as discounted pricing.
- Investigate building/expanding bike lockers and showers for employees.
- Promote biking to work.
- Post rideshare notices on employee bulletin boards to facilitate car pooling.
- Allocate a number of parking stalls exclusively for car pooling or hybrid vehicles.

Couriers

- Avoid couriers by scanning and emailing documents rather than sending hard copies.
- Use green couriers where possible.

Suppliers and Contractors

- Develop environmental provisions in supplier contracts.
- Use local suppliers to reduce the environmental impact of supplies.
- Encourage suppliers and contractors to eliminate all non-reusable containers brought onsite.

General

- Create an environmental committee to generate more ideas regarding energy reduction strategies.

Appendix 3 – Answers to Exercises

Answer to the Exercise 4

Bob's Bakery has emitted 4.86 t CO2e from Diesel for Deliver Truck:

$$1,800\ L \times \frac{2.7\ kgofCO_2e}{L} = 4,860\ kgofCO_2e \times \frac{1metrictonne}{1{,}000kg} = 4.86\ tCO_2e$$

GHG emissions from Purchased Electricity: 22.80 tCO2e

$$1,900,000\ kWh \times 60\% \times \frac{0.02\ kgofCO_2e}{kWh} = 22,800\ kgofCO_2e \times \frac{1metrictonne}{1{,}000kg} = 22.80\ tCO_2e$$

GHG emissions from Business Air Travel: 0.40 tCO2e

$$4,000\ pkm \times \frac{0.1\ kgofCO_2e}{pkm} = 400\ kgofCO_2e \times \frac{1metrictonne}{1{,}000kg} = 0.40\ tCO_2e$$

GHG emissions from Office Paper: 0.52 tCO2e

$$80\ reams \times \frac{6.5\ kgofCO_2e}{ream} = 520\ kgofCO_2e \times \frac{1metrictonne}{1{,}000kg} = 0.52\ tCO_2e$$

Table 7: GHG Emissions Calculations for Bob's Bakery

Emissions Source	Activity Data	Emissions Factor	tCO_2e
Scope 1			
Natural Gas	2,400 GJs	56 kg of CO_2e per GJ	80.64
Diesel for Delivery Truck	1,800 L of Diesel	2.7 kg of CO_2e per L	4.86
Scope 2			
Purchased Electricity	1,900,000 kWh	0.02 kg CO_2e per kWh	22.80
Scope 3			
Employee Commuting	14,700 km	0.2 kg of CO_2e per km	2.94
Business Air Travel	4,000 pkm on short-haul flights	0.1 kg of CO_2e per pkm	0.40

Office Paper	80 reams (0% recycled)	6.5 kg of CO_2e per ream	0.52
Total GHG Emissions (tCO2e)			**112.16**

Answer to the Exercise 5

North Shore Heliskiing reduced its emissions between 1990 and 2000 and between 1990 and 2010 as:

Absolute Targets

- Reduce absolute emissions by **8.33%** between 1990 and 2000 (2,400 tCO_2e - 2,200 tCO_2e ÷ 2,400 tCO_2e = 8.33%)
- Reduce absolute emissions by **16.67%** between 1990 and 2010 2,400 tCO_2e - 2,000 tCO_2e ÷ 2,400 tCO_2e = 16.67%)

Intensity Targets

- Reduce emissions from 1.33 tCO2e/per skier to **1.16 tCO2e/skie**r between 1990 and 2000 (2,400 tCO_2e ÷ 1,800 skier = 1.33 tCO_2e/skier, 2,200 tCO_2e ÷ 1,900 skier = 1.16 tCO_2e/skier)
- Reduce emissions from 1.33 tCO2e/skier to **1.18 tCO2e/skier** between 1990 and 2010 (2,400 tCO_2e ÷ 1,800 skier = 1.33 tCO_2e/skier, 2,000 tCO_2e ÷ 1,700 skier = 1.18 tCO_2e/skier)

Table 8: Operational Information for North Shore Heliskiing

Year	GHG Emissions (tCO_2e)	Yearly Skiers	% Change in Absolute Emissions	GHG Intensity per Skier
1990	2,400	1,800	-	**1.33**
2000	2,200	1,900	**8.33%**	**1.16**
2010	2,000	1,700	**16.67%**	**1.18**