



Climate Action

Carbon Calculation Workshop for Building Ecosystem

Thursday 28th October 2021



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WAO Intro



Learning Objectives

At the end of this workshop you will:

- Understand how greenhouse gas emissions are calculated against an international standard
- Understand more about which activities you do a business that produce greenhouse gas emissions.
- Know what data you need to collect to estimate your own businesses emissions and how to input this into the app.

Workshop Running Order

- Introduction to Greenhouse Gas Emissions Reporting
- Setting out Business' Emissions Boundary
- Collecting Data and Calculating our Footprint
- Future Actions

EAS Intro: Who are we?

- Environmental Accounting Services (EAS) are an Environmental Consultancy based in Central Otago, New Zealand.
- We support measurement, reporting and verification of greenhouse gas emissions that meet international best practice standards.
- We are accessible, reputable experts who will work with you to create business solutions to transition to sustainable practices and to mitigate the impacts of climate change.



Who we work with



- Environmental Accounting Services (EAS) have been providing greenhouse gas mitigation advice and solutions to local and global clients for more than 20 years.



Recent Local Case Studies

- SAANZ (Cardrona, Treble Cone)
- Lake Matheson Café
- Decode
- Wildwire
- Lakeland Wanaka
- EcoWanaka Adventures
- Ridgeline Tours
- Local Aviation Tour Provider

Around the Room Introductions

- Who are you?
- What business are you from?
- Out of 5, knowledge of the greenhouse gas emissions from your business?



TAKE URGENT ACTION TO COMBAT CLIMATE CHANGE AND ITS IMPACTS

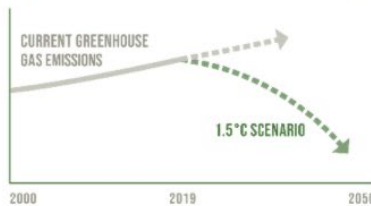
THE CLIMATE CRISIS CONTINUES, LARGELY UNABATED



2020 GLOBAL AVERAGE TEMPERATURE AT 1.2°C ABOVE PRE-INDUSTRIAL BASELINE

WOEFULLY OFF TRACK TO STAY AT OR BELOW 1.5°C AS CALLED FOR IN THE PARIS AGREEMENT

RISING GREENHOUSE GAS EMISSIONS REQUIRE SHIFTING ECONOMIES TOWARDS CARBON NEUTRALITY



CLIMATE FINANCE INCREASED

BY 10%
FROM 2015-2016
TO 2017-2018,
REACHING AN
ANNUAL AVERAGE OF
\$48.7 BILLION

125 OF 154 DEVELOPING COUNTRIES ARE FORMULATING AND IMPLEMENTING NATIONAL CLIMATE ADAPTATION PLANS

HIGHEST PRIORITY AREAS INCLUDE



FOOD SECURITY AND PRODUCTION



TERRESTRIAL AND WETLAND ECOSYSTEMS



FRESHWATER RESOURCES



HUMAN HEALTH



KEY ECONOMIC SECTORS AND SERVICES

UN Sustainability Goal #13

<https://sdgs.un.org/goals/goal13>

Take urgent action to combat climate change and its impacts*

National Context

- **New Zealand commits to reduce greenhouse gas emissions to 30% below 2005 levels by 2030. – NDC to UN**
- New Zealand passed its **Zero Carbon amendment** to the Climate Change Response Act in 2019, which sets a target for all greenhouse gases except for biogenic methane – methane from agriculture and waste – to **reach net zero by 2050**

Greenhouse Gases are Reported as Carbon Dioxide Equivalents

- Every business produces greenhouse gas emissions as part of operating.
- Emissions are reported most commonly as carbon dioxide, methane and nitrous oxide. Although there are other greenhouse gases such as refrigerants HFC's etc
- When we report greenhouse gas emissions, in order to give a clear and relatable figure, carbon dioxide is used as a reference figure and the other gases are converted into **carbon dioxide equivalent** values.
- A greenhouse gas inventory or footprint is measured and reported as a total in tonnes of Carbon Dioxide Equivalents tCO₂e

Global Warming Potential

Gas	Chemical Formula	Lifetime (years)	Global Warming Potential (100 years)
Carbon dioxide	CO ₂	100	1 (reference value for other gases)
Methane	CH ₄	12	21
Nitrous Oxide	N ₂ O	120	310

Source: <https://unfccc.int/process/transparency-and-reporting/greenhouse-gas-data/greenhouse-gas-data-unfccc/global-warming-potentials>

Greenhouse Gas Emission Calculation

$$\text{Emission (tCO}_2\text{e)} = \text{Activity Data} \times \text{Emissions Factor}$$

Activity Data

- Your business' operational data such as:
 - Litres of fuel burnt
 - kg of waste sent to land fill
 - kWh of electricity purchased

Emission Factors

- Based on historical scientific data
- Published by the Ministry for Environment and updated regularly (every two years).

Emission source	Unit	kg CO ₂ -e/unit	kg CO ₂ /unit	kg CH ₄ (kg CO ₂ -e)/unit	kg N ₂ O (kg CO ₂ -e)/unit
Regular Petrol	Litre	2.453	2.346	0.0276	0.0797

These numbers are the emission factors for data in litres.

Example Calculation

Emission						
Emission source	Unit	Activity Data	kg CO ₂ -e /unit	kg CO ₂ /unit	kg CH ₄ (kg CO ₂ -e)/unit	kg N ₂ O (kg CO ₂ -e)/unit
Regular Petrol	Litre	50	122.65	117.3	1.38	3.985



Sum of other three

Summary of Emissions

Activity	Quantity	Unit	Emissions (tCO2e)	Percentage of Total
Diesel For Transport (Litres)	4431.84	litres	11.90	23.29 %
Petrol For Transport (Litres)	13605.06	litres	33.30	65.17 %
Electricity	651	kWh	0.07	0.13 %
Electricity T&D	651	kWh	0.01	0.01 %
HotelNZ	2	Nights	0.03	0.05 %
Domestic Flights	2040	km	0.27	0.52 %
Rental Cars	50	km	0.01	0.02 %
Taxis	100	\$ Spent	0.01	0.01 %
Staff Commute Petrol (Distance)	2500	km	0.66	1.3 %
Working From Home	484	days	0.44	0.86 %
Waste to Landfill	30	kg	0.04	0.07 %
Organic Waste Composting	5	kg	0.00	0.0 %
Aviation Fuel Kerosene (Third Party)	1680	litres	4.42	8.65 %

Greenhouse Gas Emissions Accounting & Reporting

Existing international standards in the reporting and accounting of GHG emissions:

- include the GHG Protocol from the World Resources Institute and ISO 14064.

Five Principles

Relevance

- The inventory serves the decision-making needs of the users.

Completeness

- All relevant sources and emissions are counted and reported.

Consistency

- Consistent methodologies allow for meaningful comparison with other periods and with other sites.

Transparency

- Full disclosure of data sources and methodologies with a clear audit trail.

Accuracy

- Emissions quantification is systematically neither over nor under actual emissions, and uncertainties minimized, within reason. Users are able to make decisions with reasonable assurance as to the integrity of the information.



Emissions Producing Activities

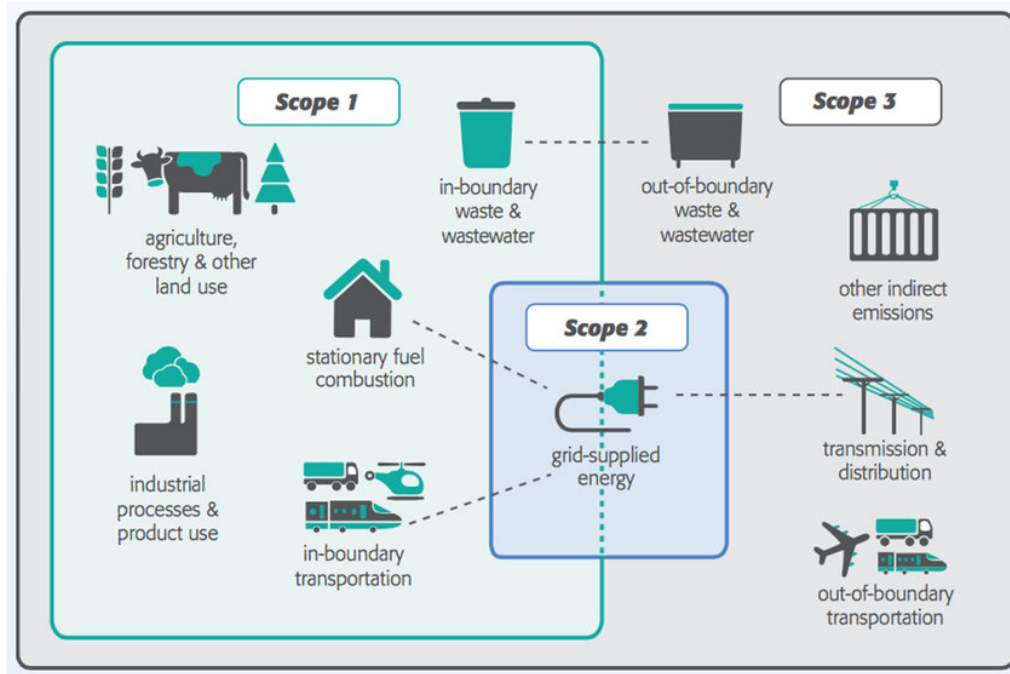
Direct and Indirect Emissions

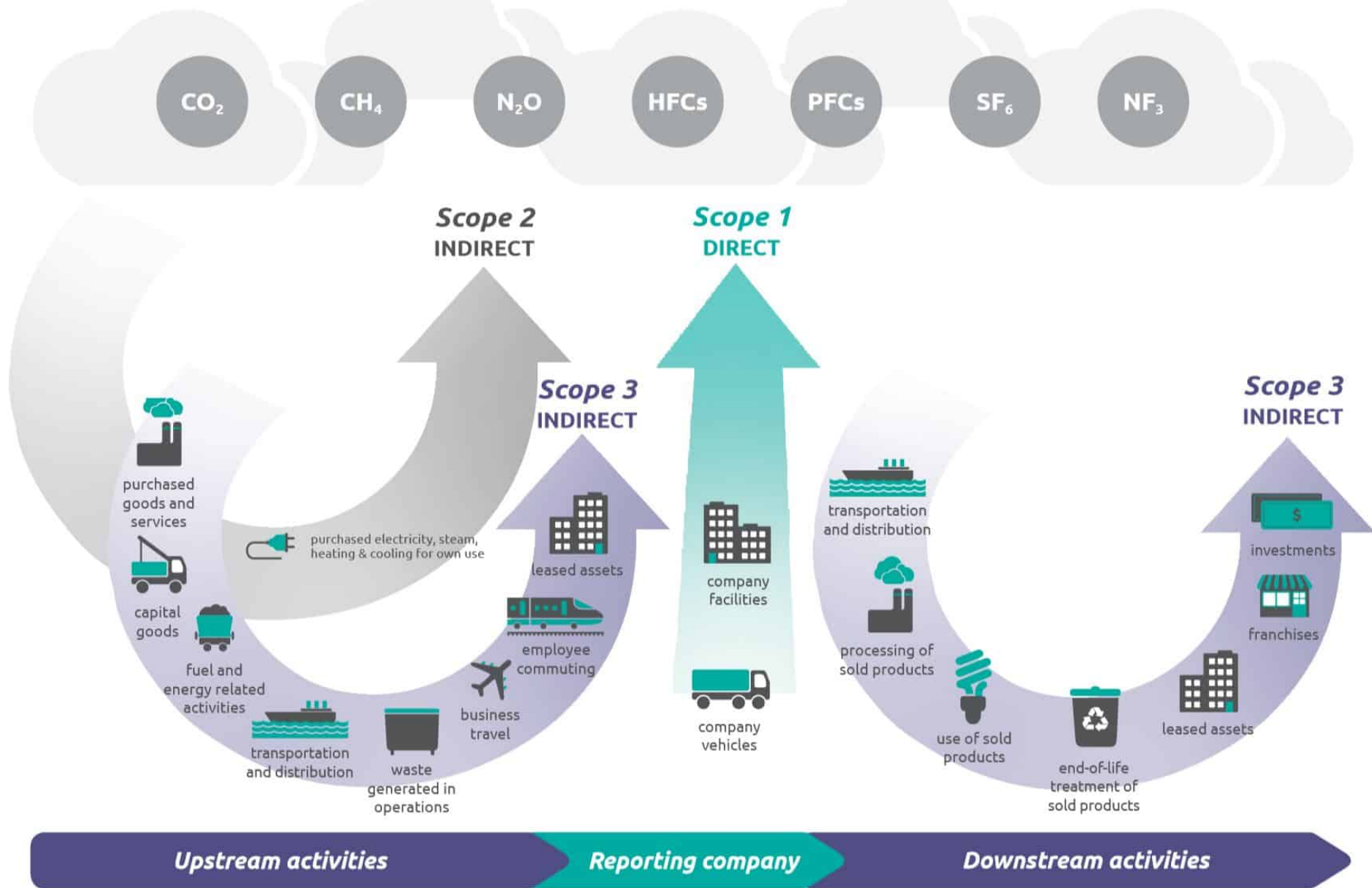
- Direct GHG emissions are emissions from sources that are owned or controlled by the company.
- Indirect GHG emissions are emissions that are a consequence of the activities of the company but occur at sources owned or controlled by another company.

Emissions Activities

Emissions Activities are split into three 'Scopes':

- Scope 1: Direct Emissions (e.g Fuel Use)
- Scope 2: Indirect Emissions from Purchased Electricity
- Scope 3: Indirect Emissions from 3rd party sources (not owned or operated by your organisation) e.g Waste to Landfill and Deliveries





Inventory vs Footprint

Inventory	Footprint
Scope 1 and 2	Scope 1, 2 and 3
Often for regulatory reporting	Wider scope for voluntary reporting and understanding the wider influence of your businesses activities

Carbon Footprint?



Quantity of
Greenhouse Gas
Emissions
measured in tonnes
of carbon dioxide
equivalents (tCO₂e)

Dependent on the
reason for calculation
and different for every
business/individual
depending where they
set the boundary

Benefits of a Footprint

Kaitiakitanga and being proactive in managing your organisation's impact on the environment

Cost efficiencies through identifying areas of high emissions which could benefit from a more efficient operating method

Marketing of Products/ Service offerings to a consumer market who are increasingly more environmentally aware

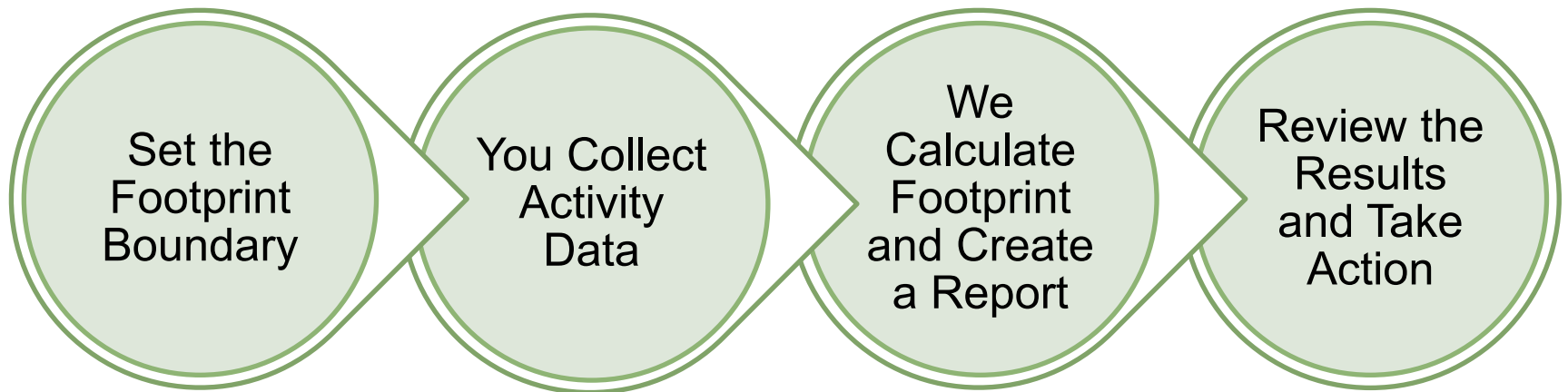
Better understanding the impact of your supply chain on your emissions

Education of staff and other members of your industry about emissions and ways to reduce the impact of your organisation

Identify a pathway to environmental verification and certification as a business

Calculate your Footprint

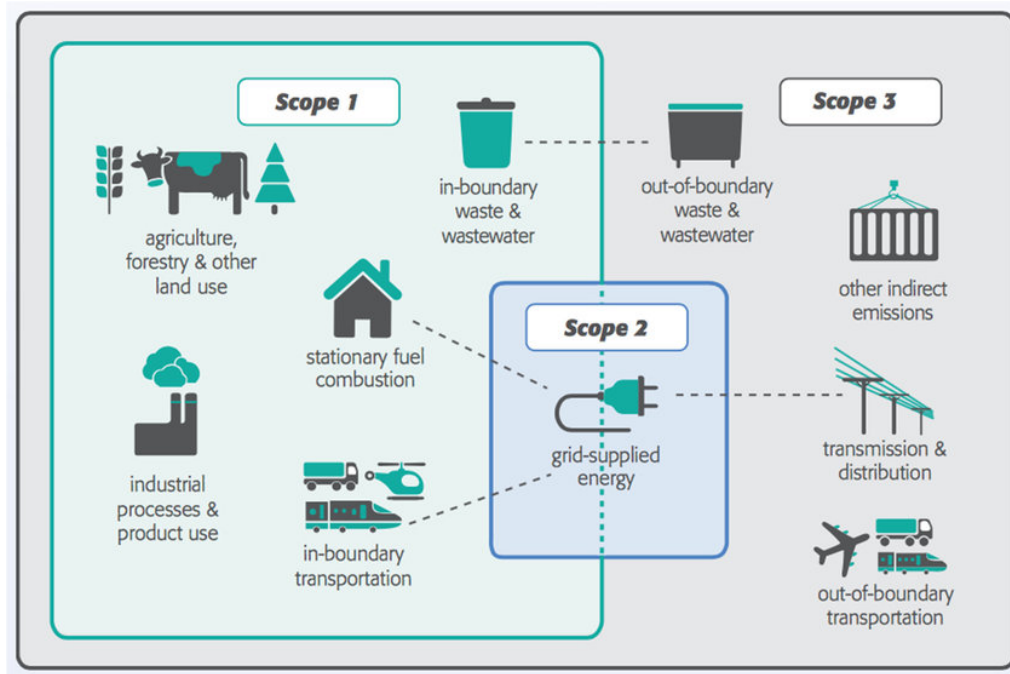
We will support you to calculate your emissions footprint for a defined inventory period through the following process:



Emissions Activities

Emissions Activities are split into three 'Scopes':

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Options for Scope 3 – Footprint Boundary

- **Scope 3A** are the Scope 3 emissions which the organisation can influence, even though it does not control the sources.
- **Scope 3B** are the Scope 3 emissions which the organisation cannot influence to any reasonable extent. These will not be included in the footprint.

Scope 3 Checklist

1. Are emissions **large** (or believed to be large) relative to the company's scope 1 and scope 2 emissions
2. Are they deemed **critical** by key stakeholders (e.g. feedback from customers, suppliers, investors, or civil society)
3. **Can potential emissions reductions** be undertaken or influenced by the company.

Example 1

Footprint Boundary: EAS

Scope 1	Scope 2	Scope 3
LPG Firewood	Electricity	Electricity T&D Staff Commuting Petrol Working from Home Waste to Landfill Water Wastewater

Example Excluded (3B):

Ad hoc deliveries – not a significant emission/ very hard to influence.

Web Server emissions – very challenging to gather data for or influence

Example 2

Footprint Boundary: Ski Field

Scope 1	Scope 2	Scope 3
Diesel (Transport and Stationary Combustion) Petrol (Transport) LPG Firewood	Electricity	Electricity T&D Staff Commuting Petrol Staff Commuting Diesel Skier Travel to Ski Field Deliveries Working from Home Waste to Landfill Water Wastewater

Example Excluded (3B):
Embodied Emissions in purchases, retail/food.

Building/Construction Emissions

The activities at each life cycle stage of a building are shown in Figure 3:

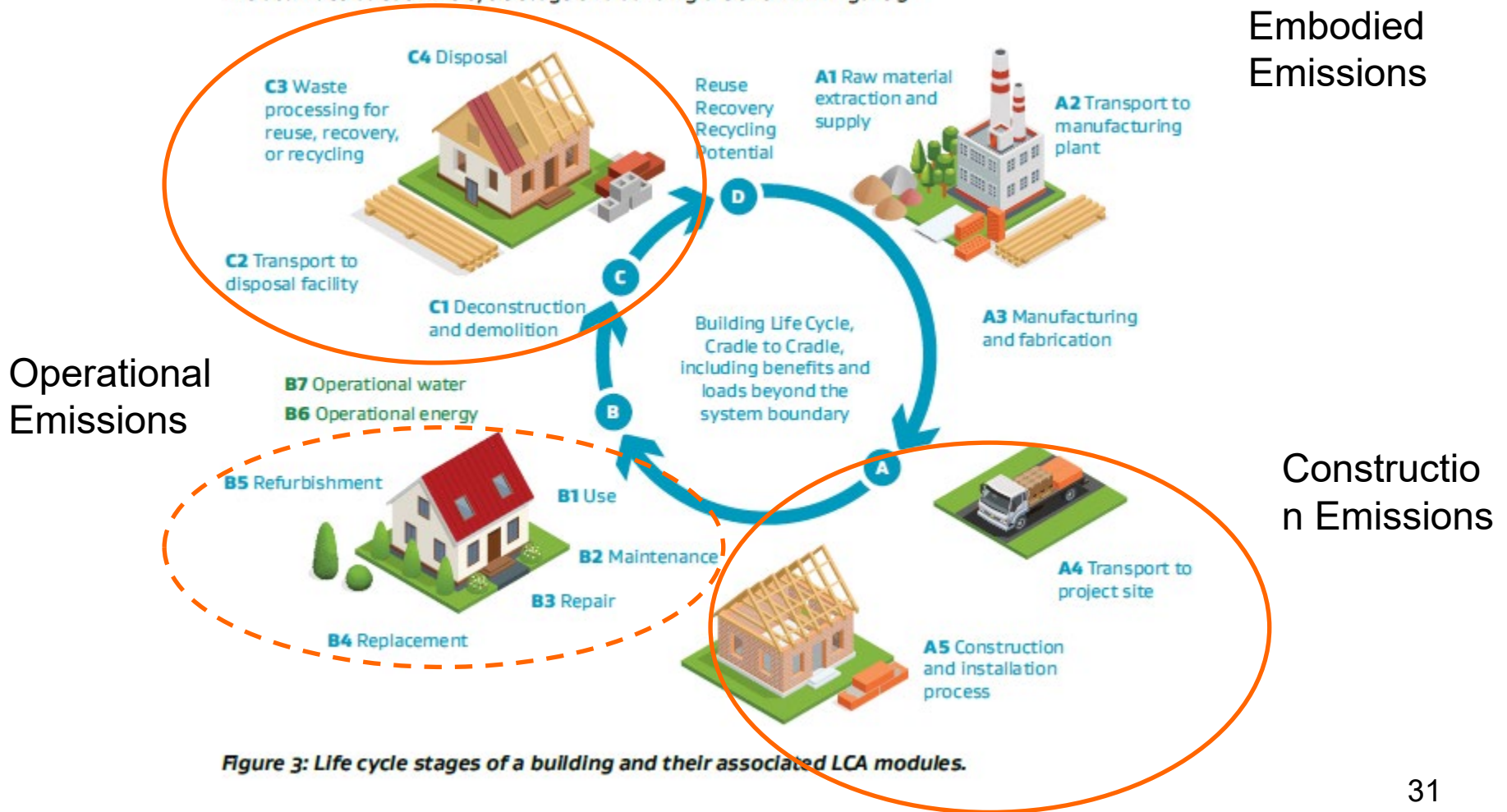


Figure 3: Life cycle stages of a building and their associated LCA modules.

Building Carbon Emissions

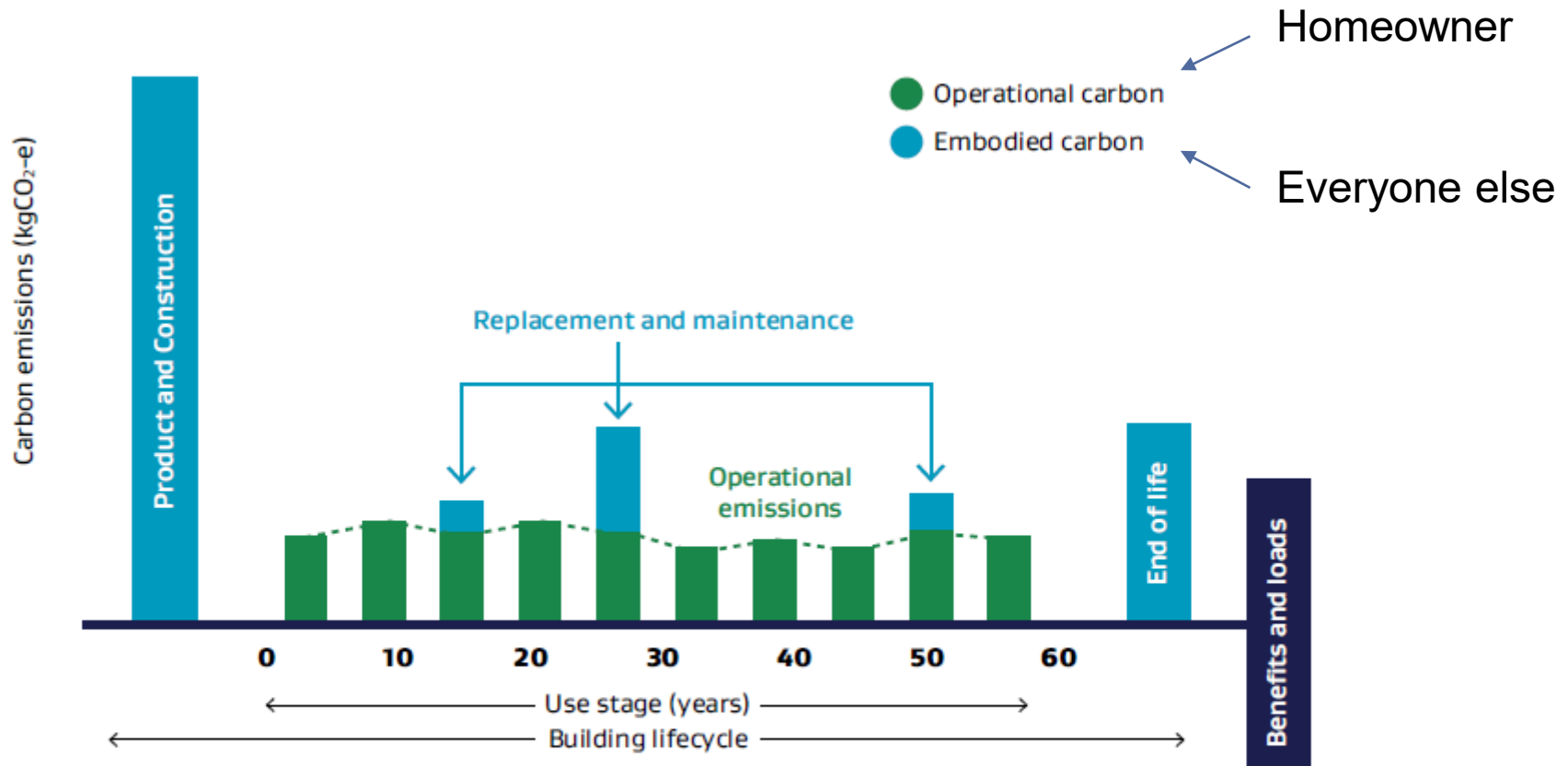


Figure 1: Operational and embodied carbon emissions over the life cycle of a building³.

Source:

Whole-of-Life Embodied Carbon Emissions Reduction Framework Aug 2020

Making the green part of the pie smaller

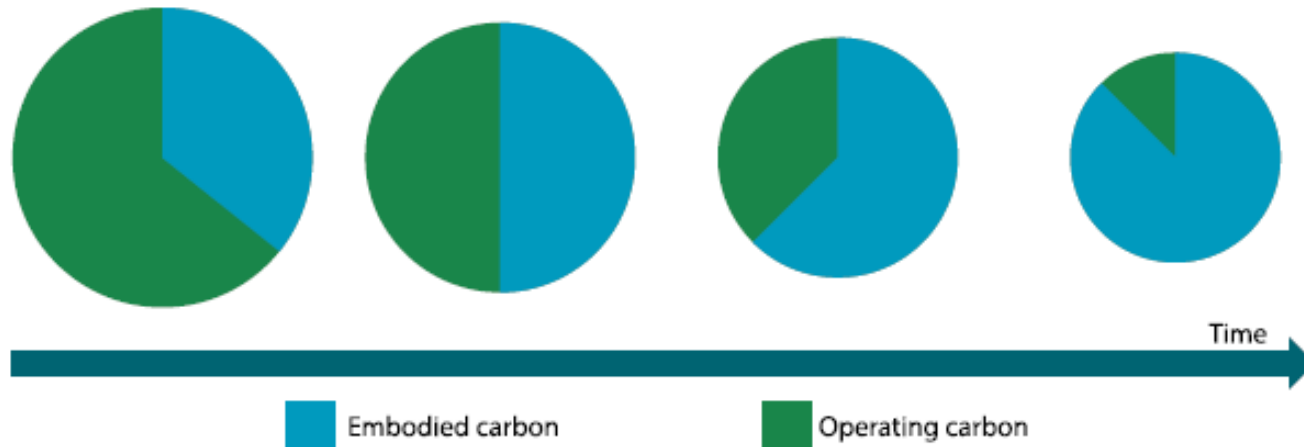


Figure 4: As building operational emissions decrease over time, embodied emissions make up a greater proportion of emissions over the whole life of a building.

Emissions Activities 'Bingo'

- Taken work with previous tourism and services companies to create a industry focused 'wide' boundary.
- Each business has their own sheet which shows the wide boundary taken from the previous workshops.
- First you will try and identify your activities then we will run through all the activities and you can confirm whether they are in or out of your boundary

Think about your Businesses Boundary

- Organizational Boundary vs Personal Boundary
- Financial Entity or Operational Boundary
- Home Offices vs Leased Buildings
- Working from Home

Select Your Activities

- Time to run through the activity sheet and tick the activities your businesses carries out in the 'self' column.
- Also note the data source if you know it, e.g fuel card or electricity supplier

Scope 1 Emissions: Fuel

Emission Activity	Unit	Data Source	Info
Transport Fuel			
Diesel e. G Utes, 4WD, Vans, Trucks, Buses	Litres (or km)	Potentially a few different vehicles. Purchases from petrol station, regular invoices for fuel, mileage on vehicles from WOF	Litres is the most accurate because it isn't affected by the efficiency of the engine. 1 litre of diesel will produce a specific emissions, whether that gets your 1 km or 2km depends on your vehicle. If data is only available in km we can use default emissions factors to estimate this using national data.
Petrol	Litres (or km)	As above, plus petrol could be used for portable generators etc.	As above.

Scope 1 Emissions: Fuel Cont

Emission Activity	Unit	Data Source	Info
Transport Fuel Cont			
Aviation Fuel (Kerosene/ Jet A1 Or Aviation Gasoline (QAV-1)	Litres	Purchases, receipts, invoices	The Emissions factors I currently have are for Aviation Kerosene Jet A1 or Aviation Gasoline

Scope 1 Emissions: Fuel

Emission Activity	Unit	Data Source	Info
Stationary Fuel			
LPG (Hot Water, Boilers, generators)	kg	Gas Supplier, Purchase Orders, Invoices.	Estimate of kg used during the year. Might have purchased more than you used. How will you account for this?
Firewood	Cubic Meters (or kg)	Purchase Orders, Informal purchases, Guess/Weight it!	Assumes softwood as a default (Pine, Fir, Manuka).

Scope 2: Indirect Emissions from Electricity

Emission Activity	Unit	Data Source	Info
Electricity from Grid	kWh	Electricity Bill/Supplier	<p>Some suppliers make claims about their electricity being from renewable sources. The electricity should still be included in the footprint as a national emission factor is used which includes electricity produced by fossil fuels. Overall aim: Reduce!</p> <p>Offset from verified renewable energy suppliers can be added e.g Ecotricity</p>

Note: An Electricity Transmission and Distribution Emission (Scope 3) will also result from the kWh data inputted. This will be calculated from the same input value.

Scope 3 Emissions: Business Travel

Emission Activity	Unit	Data Source	Info
Business Travel			
Hotel Stays	Total Number of Guest Nights	Invoices, travel bookings	2 people staying for 2 nights = 4 guest nights
Flights (Domestic)	km	Invoices, travel bookings	https://www.airmilescalculator.com/ Air NZ also tell you and you can have an option to purchase offsets.
Rental Cars	km	Invoices, travel bookings	Can be a tricky one to have historical data for but an estimate is good! Uses a default value assuming an average rental car on the road in NZ.
Taxi	\$ spent	Receipts (Uber App?)	Uses national average figures for \$/km and average car class for taxi's registered in NZ.

Scope 3 Emissions: Staff Commuting

Emission Activity	Unit	Data Source	Info
Staff Commuting			
Diesel Vehicles	km	Staff and work addresses, estimate of mileage * how many days Staff record keeping	Uses averages for diesel cars so one factor will cover all. Need to sum different staff distances up and input one total distance for the activity.
Petrol Vehicles	km	Staff and work addresses, estimate of mileage * how many days Staff record keeping	Uses averages for petrol cars
Public Transport (e.g Bus)	km	Staff and work addresses, estimate of mileage * how many days	Uses national figures for buses
EV Car	Km	Staff and work addresses, estimate of mileage * how many days Staff record keeping	Uses average national figures for electricity use and consumption for EV cars – developing science

Scope 3 Emissions: Staff

Emission Activity	Unit	Data Source	Info
Working From Home			
Working From Home	Total Days	Employee/HR Records	The emissions factor assumes an 8 hour working day.

Scope 3 Emissions: Staff

Table 14: Data used to calculate the default emission factor.

Emission source	Unit	kg CO ₂ -e/unit	kg CO ₂ /unit (kg CO ₂ -e)	kg CH ₄ /unit (kg CO ₂ -e)	kg N ₂ O/unit (kg CO ₂ -e)	Assumptions
Monitor	Employee per day	0.020	0.019	0.001	0.000	8 hrs per day
Computer	employee per day	0.081	0.078	0.003	0.000	8 hrs per day
Laptop	employee per day	0.010	0.009	0.000	0.000	8 hrs per day
Kettle use	employee per day	0.012	0.011	0.0005	0.00002	2 boils of a kettle (2kW) filled 500ml
Light Use	employee per day	0.010	0.009	0.00037	0.00001	12 W 8 hrs per day
Heat pump use	employee per day	0.408	0.390	0.018	0.0004	1 kW 8hrs per day half the year
Electric Heater	employee per day	0.815	0.779	0.035	0.001	2 kW 8hrs per day half the year
Waste to landfill	employee per day	0.163	-	0.163	-	21% of the year is a working year. general waste type (No-landfill gas recapture)
Waste water	employee per day	0.044	0.007	0.015	0.022	21% of the year is a working year
Water use	employee per day	0.004	0.003	0.000163	0.000003	

Scope 3 Emissions: Client Travel

Emission Activity	Unit	Data Source	Info
Client Travel			
Client Travel to/ from your Business	km	Type of vehicle (petrol/diesel)	Is there a defined distance which all clients have to travel to your business if they are coming by car?
		Distance (km) * quantity	Do clients come on buses run by third parties?
		Car/ Bus Counts	How accurately can you estimate? How can you influence it?

Methodology?

Accuracy?

Consistency?

Implementable/repeatable?

Scope 3 Emissions: Freight

Emission Activity	Unit	Data Source	Info
Freight			
Road Domestic	Tonne * km	Distance travelled, Weight on delivery certificate	<p>Requires the distance and the load transported. Can be very different for businesses with lots of deliveries.</p> <p>Work out if you can get suitable data for some big shipments as a starting point.</p>

This can be a challenge as most businesses won't be tracking this in a way that can be used to quantify it.

Uses distance and weight to calculate an emission for average road freight across NZ.

More factors are available for shipping and air freight but that is outside the scope of the discussion at this stage.

Often quite small as it's a share service unless significant weights are being transported.

e.g - 2 tonnes Chch to Wanaka = 114kgCO₂e <=> 42.5 litres of diesel

Scope 3 Emissions: Waste

Emission Activity	Unit	Data Source	Info
Waste			
Waste to Landfill	Tonnes (or kg)	<p>Skips volume estimate</p> <p>Invoices</p> <p>Weigh your bins</p>	<p>Emission Produced at Landfill</p> <p>Some Landfill has Gas recovery that reduces the emissions, unfortunately not here though</p>
Food/ Compost	Tonnes (or kg)	Weight your bin	
Recycling?	n/a	n/a	Recycling is considered as re-used or inert so no decomposition emission. Currently in NZ there are no available emissions factors for the processing of recycling (a lot is sent overseas or to landfill)
Transport of Waste			
(See Third Party Transport)			

Scope 3 Emissions: Water/WasteWater

Emission Activity	Unit	Data Source	Info
Water/WasteWater			
Water	M ³ or litres	Metering / billing?	Assumes from a municipal water supply. (Town's Water) Low emission here in NZ as it is derived from the emissions produced by the electricity required to pump it around. If you have the values then great, but not common to have them locally.
Wastewater (Municipal)	M ³ or litres	Metering / billing?	Higher than water supply as it factors the processing involved in cleaning the water. Need an estimation of quantity. Municipal Water Supply
Wasterwater (On site e.g oxidation ponds?)	M ³ or litres	Meter	Does this apply to anyone?

Scope 3 Emissions: Third Party Transport

Emission Activity	Unit	Data Source	Info
Third Party Transport			
Petrol Vehicles	Km	Operational Records/ Invoices	Working with suppliers/ partners to gather this data and helping them understand the value of it can help to get a more accurate emission calculation. What data can they supply? How are you billed?
Diesel Vehicles e.g 4wd/ Buses	Km	Operational Records/ Invoices	As above
Aviation Fuel / Helicopters	Litres	Operational Records/ Invoices	What data do you receive from these services?

Exercise: What third party transport/vehicles do we rely on?

Waste to Landfill, Recycling, Septic Tank Trucks, Skip Lorries,
Delivery Vans, Charter Buses, Charter Helicopter.....

Scope 3 Emissions: Third Party Elec

Emission Activity	Unit	Data Source	Info
Third Party Elec			
Third Party Electricity	kWh	Invoices/ Electricity Bills	Do you use electricity but you are not the bill payer? E.g you operate an office in a shared building? Someone else pays the bill then charges you a proportion of it?

Other Activities?

Scope 1:

- Reticulated Gas, Biofuels
- Fugitive Emissions – From refrigerants (walk-in chillers etc)
- Agriculture/Livestock
- Land Use (Plantations/Forests Growth and Removals)

Scope 3:

- Deliveries and Freight
- Construction Materials (e.g Steel, Aluminium, Concrete)
- Embodied Emissions in Products/ Food
- Onsite Wastewater Management
- Anaerobic Digestion
- Freight Options (e.g Different Type of Ships or Trucks)
- Travel Options – Different Specific Vehicle Consumptions = Different Efs
- Data Centers (International)

Data Collection

- Input will be one total for all emissions of that activity throughout the whole period.
- Can extrapolate data across the year if some data is only sampled for a shorter period, but this reduces accuracy of the emissions estimate.
- Think of ways to estimate in the future for some of the activities if you don't have it now!

Data Input App Demo

<https://enviroaccounts.shinyapps.io/WAOSummitGHGApp/>

Available until Monday 15th November

Link is on the bottom of your data sheet and also can be found on our website, enviroaccounts.com

Example GHG Summary



Greenhouse Gas Emissions Summary

26 October, 2021

Organisation/Business Name: David's Dog Walking Service

Reporting Period

Footprint Reporting Period : 26/10/2021 - 26/10/2021

Data Submission Date: 26/10/2021

1. Methodology

This business carbon footprint provides an estimation of the emissions associated with different business activities in a defined reporting period. Greenhouse Gas Emissions for carbon dioxide, methane and nitrous oxide have been calculated for business activities using emissions factors and guidance outlined by the New Zealand Ministry for the Environment (MfE) in the 'Measuring Emissions: Detailed Guide 2020'¹.

The Greenhouse Gas Protocol², Guidelines and ISO14064:1³ have also been referenced for further guidance and development of these greenhouse gas carbon footprint estimations.

This report provides an estimation of the Greenhouse Gas Emissions for the business during the defined reporting period to provide information for internal business management and operations purposes. For certification or verification claims, further review is required with an independent verifying body.

Emission removals and offsets are not considered in this emissions summary report.

Breakout and Discussion

- Take some time to think about where you can get data from,
- What do you already have in place in your business?
- Do we need to get data from other sources?

Great I have my Carbon Footprint, what next?

After you have completed your footprint what will you do with the new information?



A) Reductions

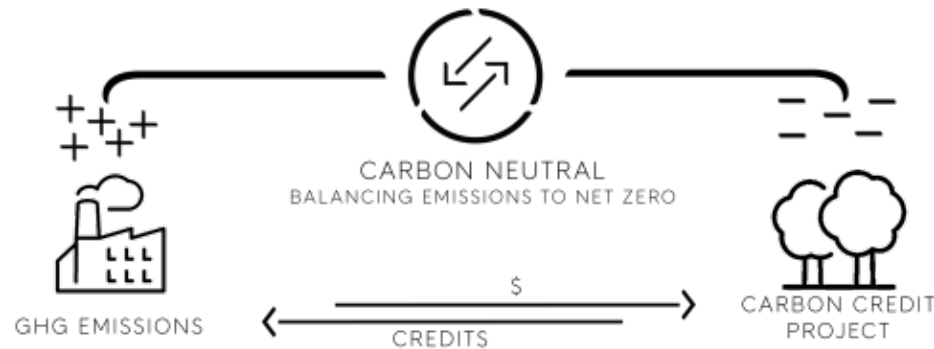
- 1. Behaviour Change** – reduction in waste, packaging, driving/travel habits, work from home/remotely options?
- 2. Operational Change** – e.g maximum trips per year, minimum numbers in vehicles
- 3. Supply Chain Considerations** - e.g energy supplier, equipment suppliers, maintenance contractors (where are they coming from? Can someone do it locally?)
- 4. Equipment/Technology Changes/ Upgrades** – vehicles, onsite energy generation

A) Reductions

- Ministry of Business, Innovation and Employment
 - Whole of Life Embodied Carbon Emission Reduction Framework
 - Sector currently contributes 20% of national GHG emissions

B) Offsets

- Offsetting is achieved when you buy a unit of CO₂e (a carbon credit) and 'retire' it against your emissions



Source:
[Toitu](https://www.toitu.govt.nz/)

<https://www.vox.com/2020/2/27/20994118/carbon-offset-climate-change-net-zero-neutral-emissions>

C) Verification

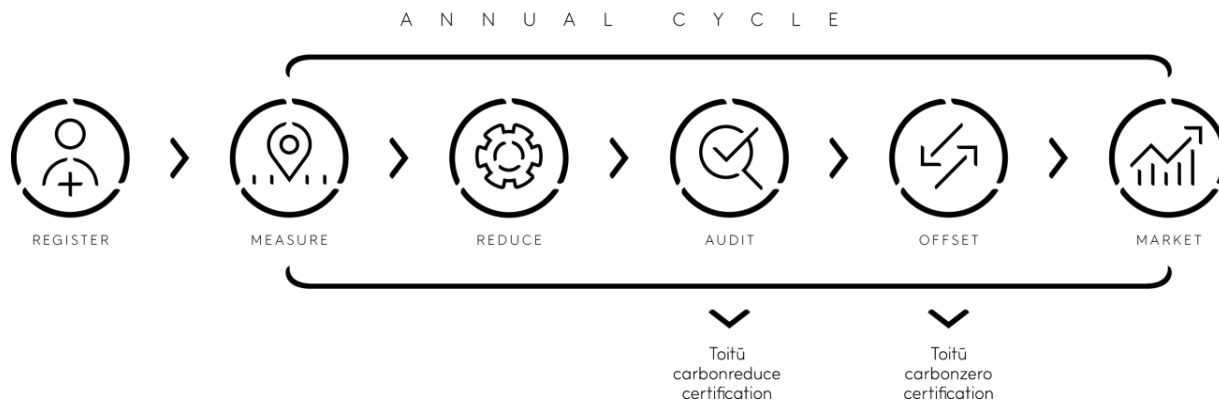
- Verification provides a confirmation that your greenhouse gas calculations have been completed following the requirements of the international standards.
- Completed by a third party on the data provided to them.
- Benefits to your business?
 - Audited, formal reduction plan and process.
 - Mark of confidence for marketing your environmental credentials

Concepts

In New Zealand, Toitū covers certification of greenhouse gas related claims as either:

- Carbon Reduce
- (Net) Carbon Zero

The terms Carbon Zero and Carbon Neutral in other global certification schemes are defined in the following slides.



But first, what now!

- Go get some data (Estimate/Guestimates are okay at the moment!)
- Put it into the app
- Send me an email with the **Rdata** file
- I'll calculate your emissions and send you a report.

projects@enviroaccounts.com

Thank You

