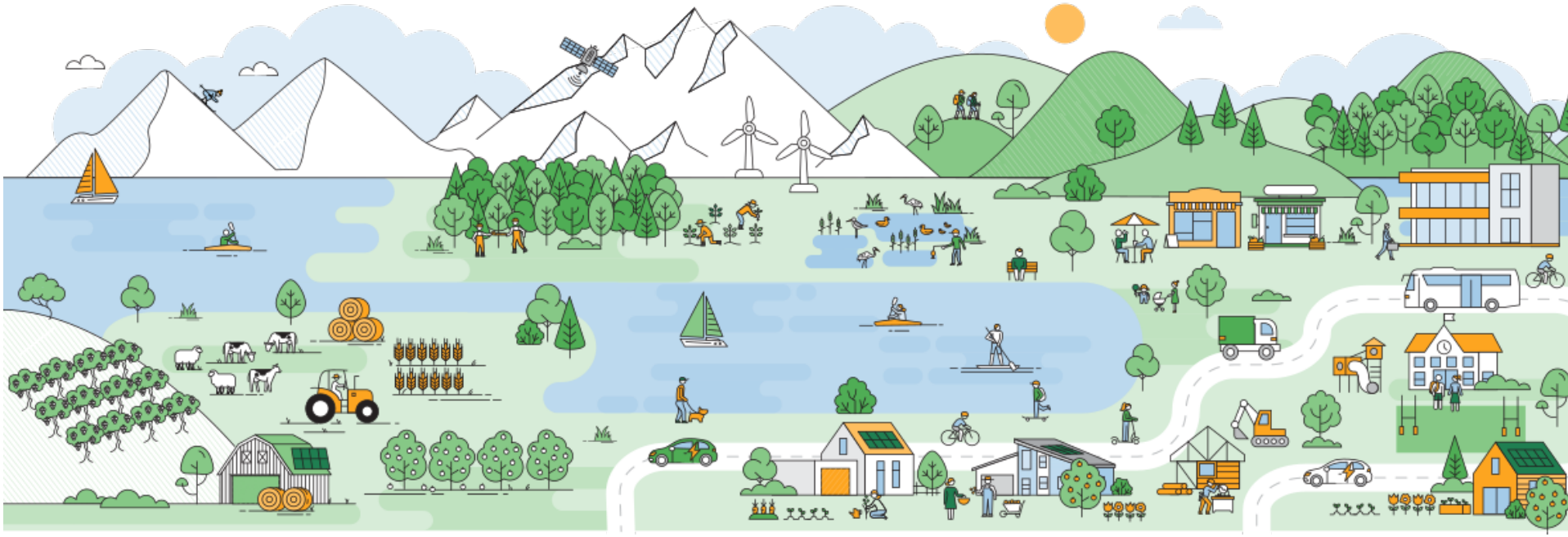


Climate Action

Carbon Calculation Workshop for Households

www.enviroaccounts.com
projects@enviroaccounts.com

eas

wao

Learning Objectives

At the end of this workshop you will:

- Understand how greenhouse gas emissions are calculated
- Understand more about which activities you do produce greenhouse gas emissions
- Know what data you need to collect to estimate your household emissions and how to use a free calculator to do that

Dr Carly Green

- Bachelor Environmental Engineering; Monash University Melbourne

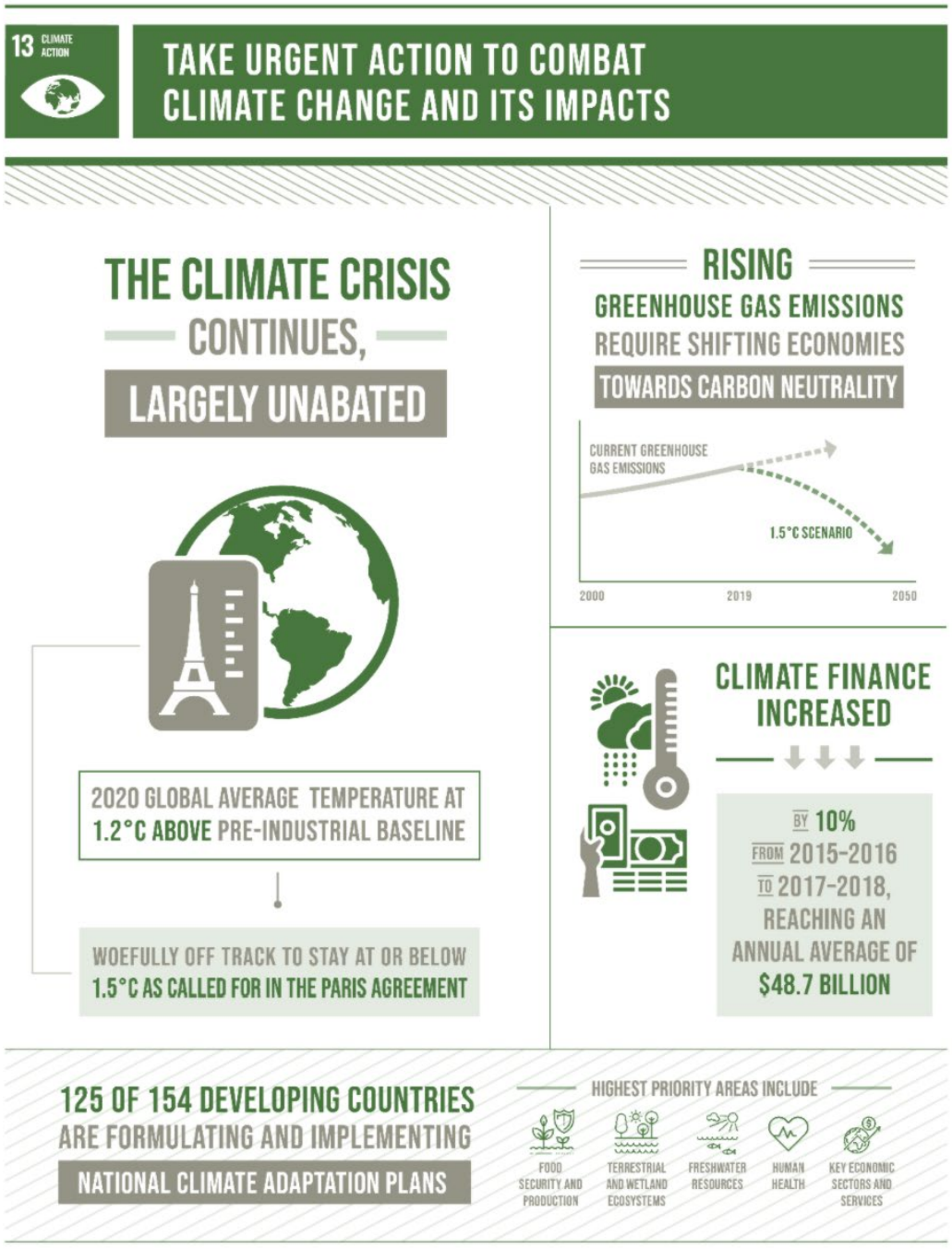
- PhD – School of Biological Science; University College Dublin
  - Greenhouse Gas Accounting the Agriculture and Forestry Sector

Affiliations and Clients

- Founding Director of Environmental Accounting Services
- IPCC Lead Author on the 2019 Refinement to the Good Practice Guidelines for National Greenhouse Gas Inventories
- Methods and Guidance Component Manager for the Global Forest Observations Initiative
- Measurement Reporting and Verification Specialist for the World Banks Forest Carbon Partnership Facility (currently supporting 3 countries)
- UNFCCC; FAO; Govts of Australia, Ghana, Vanuatu, Fiji; Private Clients across 20 countries…….
- Board of Trustees for Wao Wanaka

Around the Room Introductions

- Who are you?
- What are you most interested to understand?
- Have you calculated your emissions before?

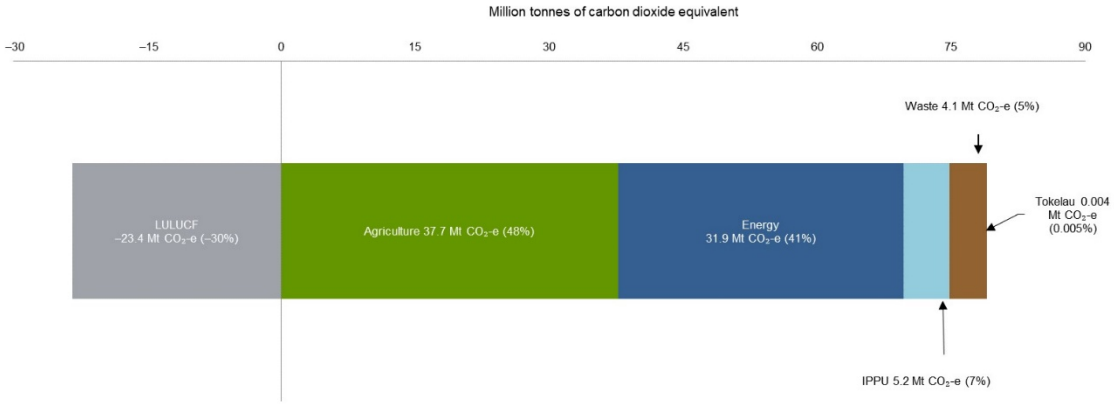


UN Sustainability Goal #13 https://sdgs.un.org/goals/goal13

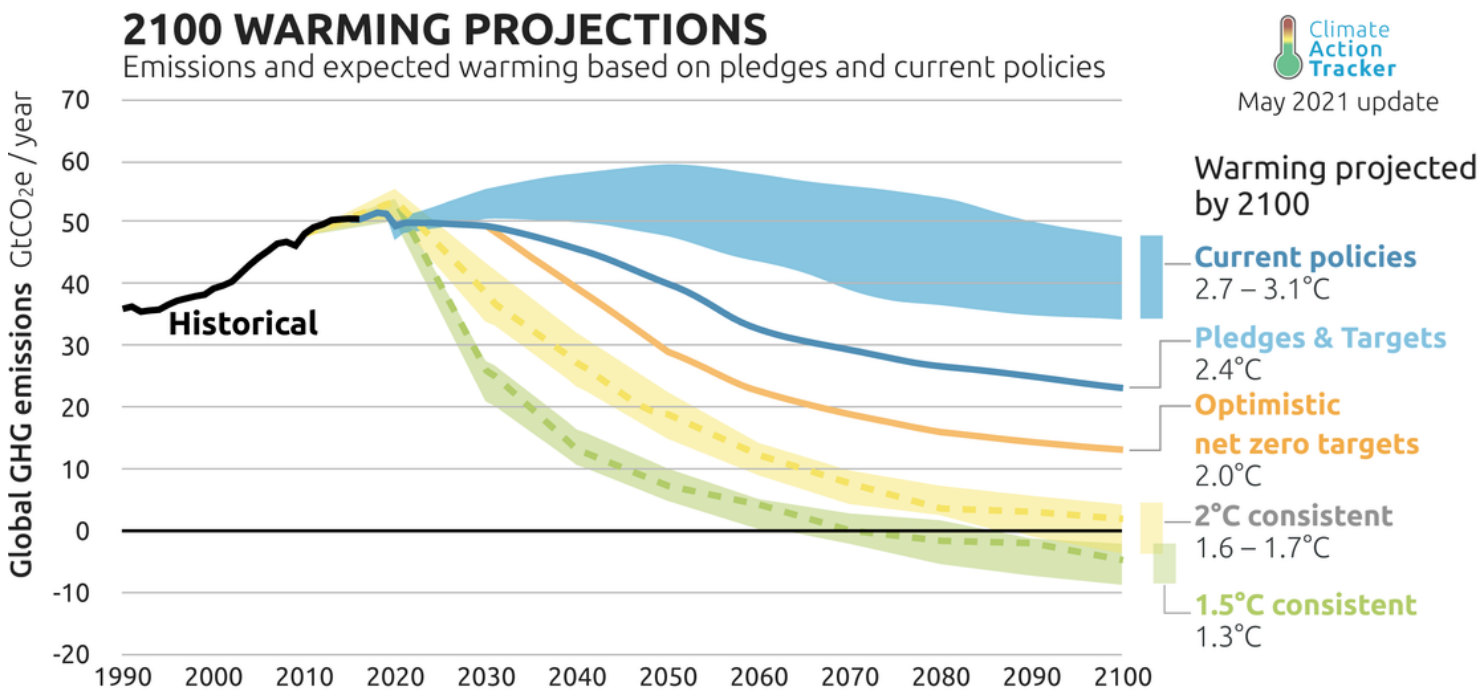
Take urgent action to combat climate change and its impacts*

New Zealand Emission Profile in 2018

- Most emissions come from Agriculture (48%) and Energy (41%)
- The Land Use, Land-Use Change and Forestry (LULUCF) sector offset nearly one third of New Zealand's gross emissions in 2018



Warming Projections



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

- 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 tCO_2e

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_2O	120	310

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

Greenhouse Gas Emission Calculation

Emission (tCO_2e) = Activity Data x Emissions Factor

Activity Data

- 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_2O (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_2O (kg CO_2-e)/unit**
Regular Petrol	Litre	50	122.65	117.3	1.38	3.985

Sum of other three

Your emissions are likely very large

On a per capita basis, New Zealand has an embarrassingly large carbon footprint, emitting more than **16 tonnes of greenhouse gases per person each year**.

Top 20 in the world - and within the top five in the OECD.

Inspiring Quotes for Encouragement

you're never too small to make a difference

– Greta Thunburg

How are you going to change the World, if you don't change yourself

- Stan Walker

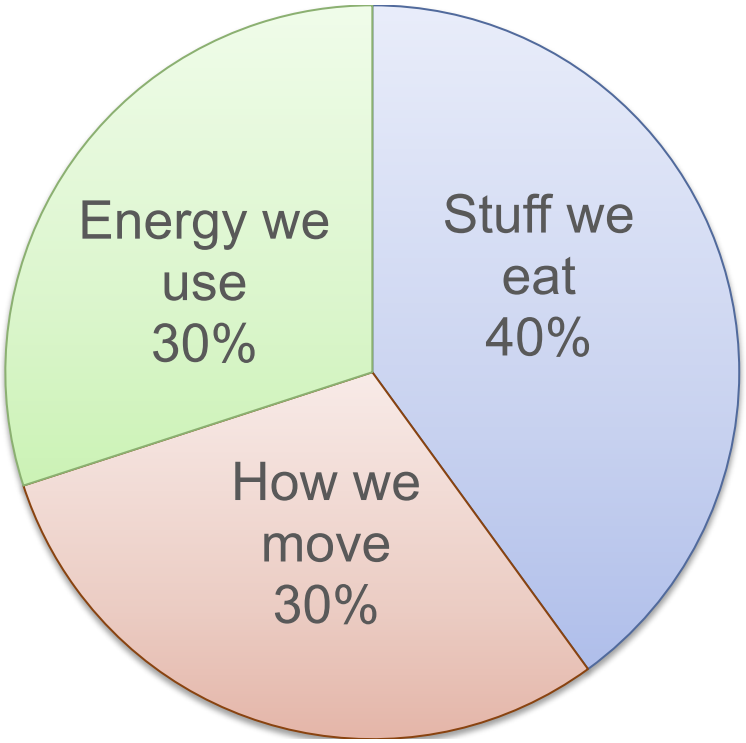
Where to Start?

Look no further than **how you move and where you shop.**

Household contribute 71 per cent of New Zealand emissions - because of the goods and services we consume.

That includes **trips in the family cars, food and beverages, and the way we use power and water.**

Proportion of Emissions



What changes have you made?

on average **households HAVE NOT made a large systematic shift in their climate-change related consumption behaviour.**

The majority of the **change in emissions due to reductions in the emissions intensity of products.**

But its all about US

If every Kiwi

didn't drive one day a week,

switched off their appliances at the wall,

and switched to low-energy lightbulbs,

we could save 386,500 tonnes of CO2-equivalent greenhouse gases per year – or around a 20th of our total emissions.

What we do matters

Take shorter showers, or outside the peak hours of 4pm and 8pm when there's most demand on the grid for fossil fuelled electricity generation.

Change to an efficient shower head - A person who showers once a day can save the equivalent of a 20kg bag of coal in a year with an efficient shower head

We can **wash our clothes in cold water**

Be a thoughtful consumer

Make goods last like clothes and home appliances

buy second-hand, and repair rather than replace.

Be a thoughtful consumer

Buy food that's sourced as locally as possible – or from New Zealand, rather than overseas fruit.

Avoid products with too much **packaging**

Compost kitchen scraps and garden waste.

Go a step further and **grow what you eat**.

Your Actions Count

Think - Do I need this.

Investigate - What has the lowest impact.

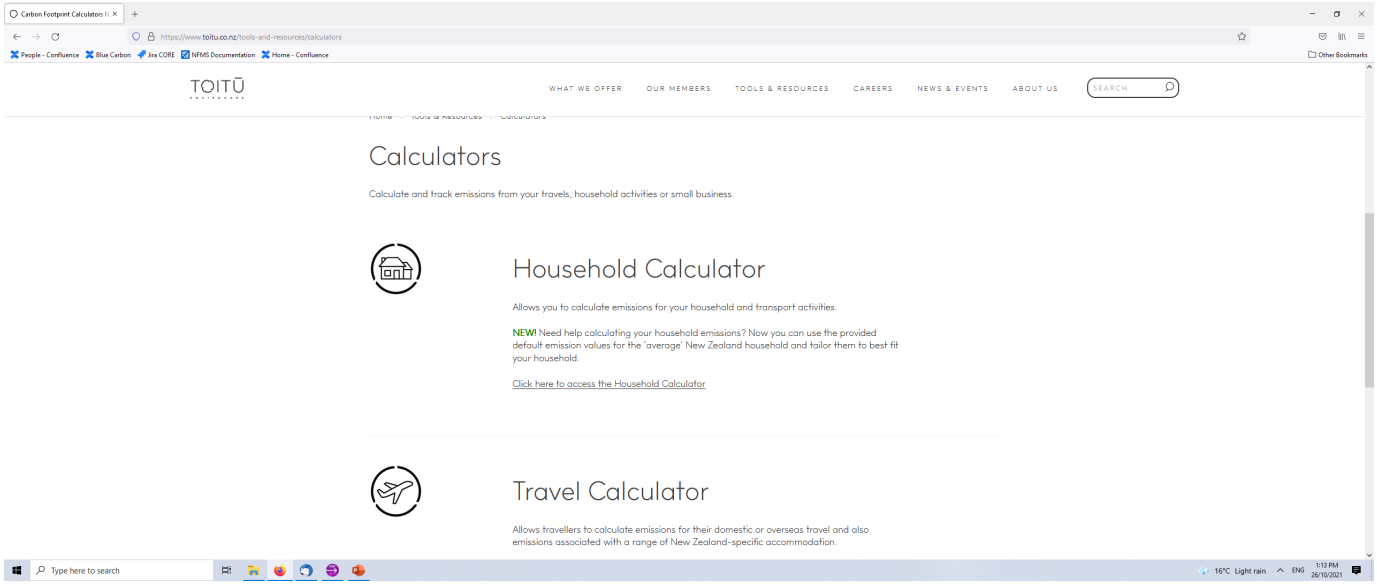
Influence - Tell/show your family and friends.

Calculating your Greenhouse Gas Emissions

Toitu have two online calculators that are useful for individuals to calculate their emissions.

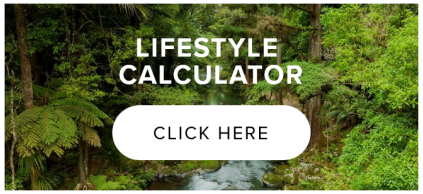
1. Calculator for Households
2. Calculation for Travel Emissions

https://www.toitu.co.nz/tools-and-resources/calculators



Ekos Calculator

https://ekos.co.nz/calculator-home-page



- Suitable for individuals and households wanting to understand the carbon impact of their lifestyle in order to support the global transition towards a net-zero future.
- Upon completion of the calculator, customers will have the option to contribute towards the establishment and protection of permanent indigenous forests in Aotearoa and the Pacific Islands (embed link) through offsetting their estimated carbon footprint.
- Will receive an Ekos Carbon Friendly certificate.

What does it cover

- How we move
- Energy we use

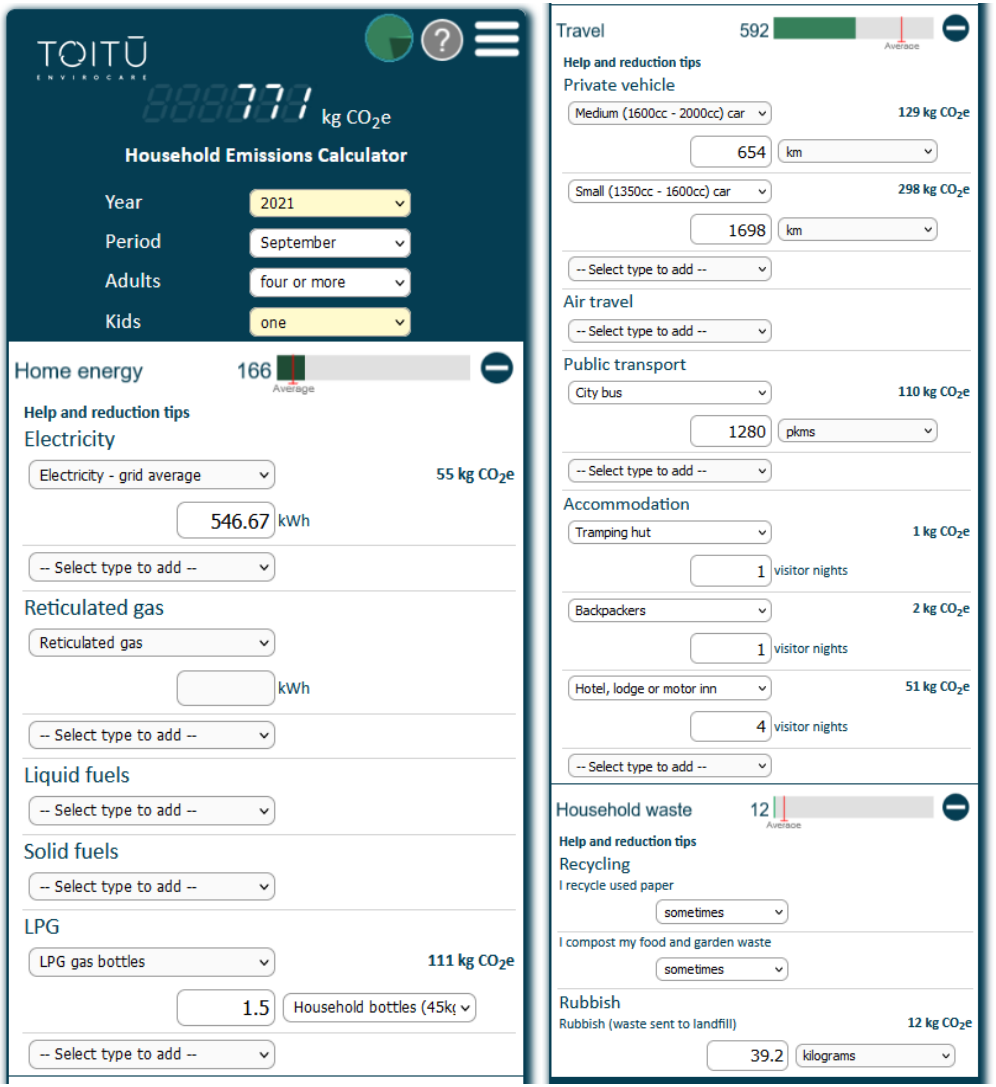
- Does not consider what we eat (or what we buy)

Case Study 1: Apollo Place Shared House

Four person household:
Electricity - 546.67kWh
Gas LPG - 67.5 (1 and half 45kg cylinder)
Rubbish - 39.2kg

Nights away from home - 8:
- 1 camping
- 1 back packers
- 1 doc hut
- 4 hotel

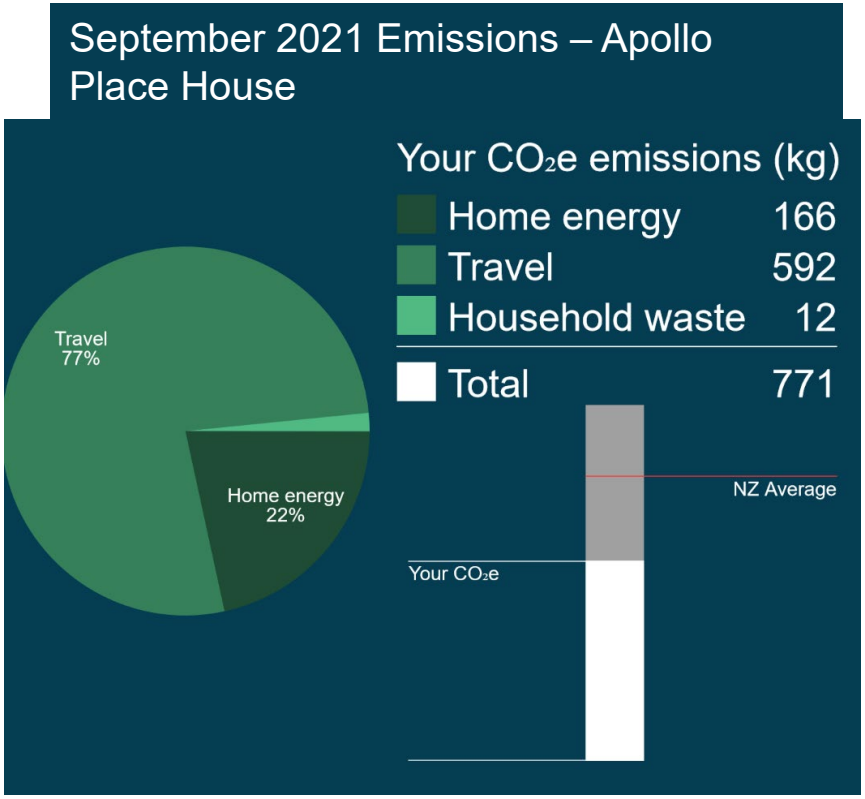
Vehicles:
Flat mate one - 1,280km - Staff bus to Cardrona
Flat mate two - 654km - Small Van
Flat mate three - 1,698km - Small Car
Flat mate four - 0

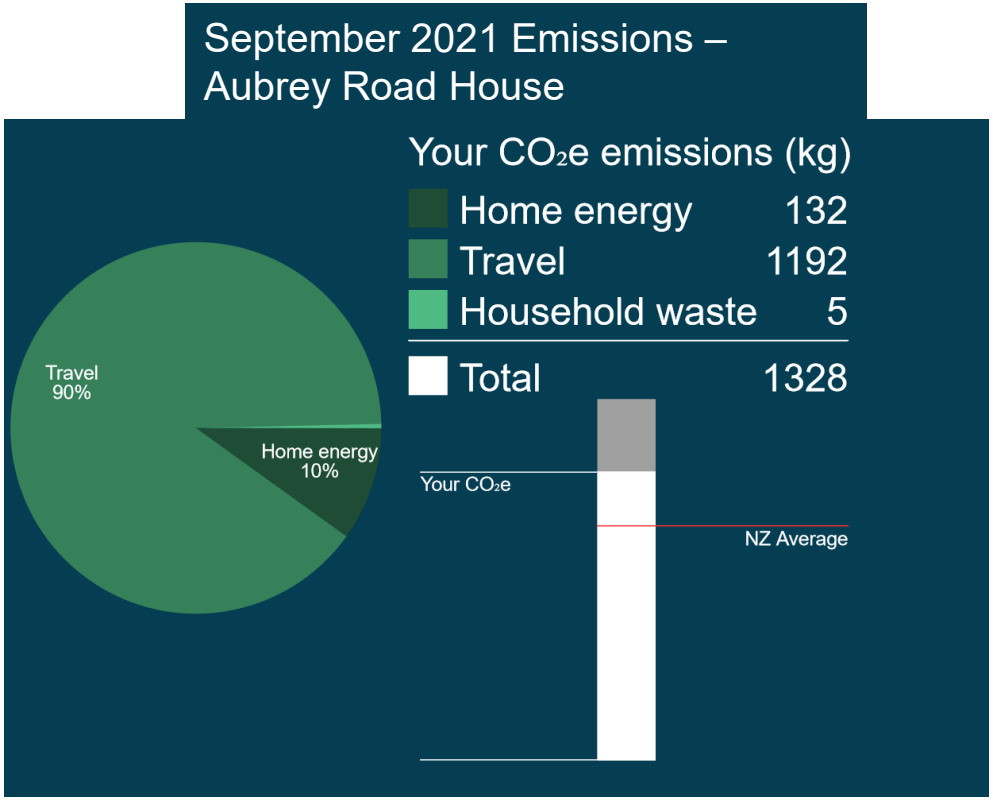


Case Study 2: Aubrey Road Shared House

- 108 Aubrey Road
- 5 People in Shared House
- Winter – Firewood used for majority of heating, not included in footprint
- Majority Vegetarian Diet – Food embodied carbon not included in footprint

Case Study Comparison





Toitu Calculator- Feedback

- Easy to use and select between a multitude of different emissions activities – travel particularly is good
- Doesn’t factor firewood – significant for warming home in winter in Wanaka
- Doesn’t factor diet of household members – embodied carbon in food
- We liked the pie chart showing the % of each emission!

What we Eat

University of Otago Study

Aim: To estimate the greenhouse gas emissions of a variety of foods in the meat and meat alternatives food group produced in New Zealand using Life Cycle Assessment.

https://ourarchive.otago.ac.nz/handle/10523/4725

What we Eat

The carbon emissions from each food per kg of raw food were as follows;

- lamb 11.2 kgCO_2e/kg
- beef 10.4 kgCO_2e/kg
- salmon 8.9 kgCO_2e/kg
- pork 6.2 kgCO_2e/kg
- chicken 2.4 kgCO_2e/kg
- eggs (free range) kg2.1 CO_2e/kg
- eggs (intensive) 1.9 kgCO_2e/kg
- tofu 1.2 kgCO_2e/kg

Emissions of various diets in New Zealand

University of Auckland Study

Aim: To compare the costs and climate impact (greenhouse gas emissions) associated with current and healthy diets and two healthy and environmentally friendly dietary patterns: flexitarian and vegan.

https://nutrition.bmj.com/content/early/2021/06/09/bmjnph-2021-000262

Family of 4 per fortnight

- *Current* diet
  - lowest mean cost NZ$584
  - highest mean climate impact of 597 $kgCO_2e$
- Healthy diet
  - NZ$637
  - 452 $kgCO_2e$
- Flexitarian diet
  - NZ$728
  - 263 $kgCO_2e$
- Vegan diet
  - highest mean cost NZ$789
  - lowest mean climate impact 203 $kgCO_2e$

Waste

- Most households have three bins:
  - General Waste – Landfill
  - Glass – Recycling
  - Plastics, Cans, Cardboard - Mixed Recycling

- Other things like e-waste, clothes, scrap metal, tyres, batteries etc – Specialist Treatment at Transfer Stations

QLDC Recycling

Where does recycling go?

Where does our mixed recycling go?

Recycling from the yellow bins goes to our Materials Recovery Facility in Frankton.

Here it is both manually and mechanically sorted into different recycling streams.

In Queenstown Lakes, we send plastics marked 2 and 5 to Comspec in Christchurch where items are recycled into industrial plastics like drainage pipe.

We send plastics marked 1 to Flight Plastics in Wellington, where it is made into food grade packaging.

Cardboard is sent to Indonesia (80%) and South East Asia (20%) and made into new cardboard packaging.

Paper is sent to India and made into paper related products.

Steel and aluminium products are sent to China and Japan and made back into items, including cans. Aluminium can be infinitely recycled.

QLDC Recycling (2)

What happens to glass recycling?

Once glass is picked up from the kerb it's taken to our glass bunkers in Wānaka and Frankton.

From there it goes to the main glass hub in the South Island, called 5R Solutions in Christchurch. Here the glass is manually inspected before its big trip north to Auckland.

In Auckland, the glass heads to Visy Glass – a plant where the glass is sorted by colour, metal bottle sleeves are removed, and the glass is crushed and ready for melting into new products.