



Ministry for the  
**Environment**  
Manatū Mō Te Taiao



# Measuring Emissions: A Guide for Organisations

2019 QUICK GUIDE

New Zealand Government

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# Minister's foreword



Last year more than 60 organisations committed publicly to reducing their emissions in line with the Paris Agreement to limit global warming to 1.5-2°C above pre-industrial levels.

The group, the Climate Leaders Coalition, now numbers more than 80 businesses. Collectively they and their supply chains make up around half of New Zealand's total greenhouse gas emissions.

These business leaders can see what's possible and they're up for the challenge. And if you're reading this guide, there's a good chance your organisation is too. The first step to managing emissions, is measuring them. This guide sets out how to do that.

As the saying goes, "you can't manage what you don't measure". So the first step for any organisation's efforts is understanding where their emissions come from. This updated guide contains updated emission factors to align with New Zealand's greenhouse gas inventory, and also many new emission factors to increase coverage of the most common emissions sources.

Yours may be a small organisation or a large one. It doesn't matter. When it comes to measuring emissions every bit counts. Collective action works. New Zealand may be small, but the collective action of other small emitters like us adds up to around a third of the world's total – more than China, the US, India or the EU.

So what your organisation does to reduce emissions matters. When you set aside time and resources to measure your emissions and reduce them be confident that what you do will be worth it, because you know others are acting too. Your organisation may even discover a competitive advantage it otherwise might not have found.

New Zealanders are ready to take on the challenge of tackling climate change and are hungry to seize on the opportunity to upgrade our economy, not simply so that it's 'clean and green' but also more productive, higher value and better paid.

A handwritten signature in black ink that reads "James Shaw". The signature is fluid and cursive, with a long horizontal stroke at the end.

James Shaw  
Minister for Climate Change, New Zealand

# Overview of changes since the previous update

This is the tenth version of the publication previously titled *Guidance for Voluntary Greenhouse Gas Reporting*.

## There have been several major updates since the ninth edition of the guide in 2016.

- This document has a new title: *Measuring Emissions: A Guide for Organisations*.
- Two documents supplement the emission factors:
  - the Quick Guide explains how to produce a greenhouse gas (GHG) inventory for your organisation. This is suitable for most users
  - the Detailed Guide contains the data sources, methods and calculations that underpin the emission factors for those who require this information.
- We have provided an example GHG report and workbook to show what they might look like. We use a fictional organisation's data to show how to apply emission factors.
- The workbook includes clearer formatting and instructions for use.
- "Operational boundaries" has been renamed "reporting boundaries" to align with *ISO 14064-1:2018*.
- There are several new categories:
  - freight transport, including domestic rail, road and shipping freight, and international air and shipping freight
  - water supply and wastewater treatment, including water supply, domestic wastewater treatment, septic tanks and industrial wastewater treatment
  - agriculture, forestry and other land use, including land use, land-use change and forestry (LULUCF), enteric fermentation, manure management, agricultural soils and fertiliser use.
- Some categories have been updated:
  - purchased energy: replaces purchased electricity and now includes guidance on heat and steam and geothermal emissions
  - business travel: includes passenger vehicles, public transport and air travel, as well as electric vehicles, plug-in hybrid and hybrid vehicles
  - materials and waste: replaces waste and now includes construction materials and compost
  - fuel: includes biofuels and aviation fuels
  - travel: includes transport by distance and taxis/rental cars, as well as air travel. Domestic emission factors have been generated for jet, medium and small aircraft
  - refrigerant use: includes the global warming potential of an extended list of refrigerants used in New Zealand.

This guide has been prepared in accordance with *ISO 14064-1:2018* and the *GHG Protocol Corporate Accounting and Reporting Standard*.

# 1. Introduction

## 1.1. Purpose of this guide

The Ministry for the Environment supports organisations acting on climate change. We recognise there is strong interest from organisations across New Zealand to measure, report and reduce their emissions. We have prepared this guide to help you measure and report your organisation’s greenhouse gas (GHG) emissions. Measuring and reporting emissions empowers organisations to manage and reduce emissions more effectively over time.

The guide aligns with and endorses the use of the *GHG Protocol Corporate Accounting and Reporting Standard* (referred to as the GHG Protocol throughout the rest of the document) and *ISO 14064-1:2018* (see section 1.3). It sets out how to quantify and report GHG emissions, and provides methods to apply emission factors to produce a GHG inventory (see section 4).

We update the guide in line with international best practice and the New Zealand Government’s *Greenhouse Gas Inventory* to provide new emission factors.

This Quick Guide is part of a suite of documents that comprise *Measuring Emissions: A Guide for Organisations*, listed in figure 1.

Figure 1: Documents in *Measuring Emissions: A Guide for Organisations*

Measuring Emissions: A Guide for Organisations	
Quick Guide	The go-to document explaining changes since the last update, how to produce an inventory and what data you need to work out emissions from your activities
Detailed Guide	For users who need to know the data sources, methodologies, uncertainties and assumptions behind the emission factors for each emission source
Emission Factors Summary	Quick look up tables providing the main emission factors for each emission source
Emission Factors Workbook	As above but in excel format across multiple tabs
Emission Factors Flat File	Simple format for integration with software
Interactive Workbook	Use this spreadsheet to input your activity data, in order to work out your organisation’s emissions and produce an inventory
Example GHG Inventory	Shows what a finished inventory might look like
Example GHG Report	Shows what a finished report might look like

THIS DOCUMENT

### Feedback

We welcome your feedback on this update. Please email [emissions-guide@mfe.govt.nz](mailto:emissions-guide@mfe.govt.nz) with the subject line ‘Measuring Emissions: A Guide for Organisations’.

## 1.2. Important notes

The information in this guide is intended to help organisations that want to report their greenhouse gas emissions on a voluntary basis. This guide does not represent, or form part of, any mandatory reporting framework or scheme.

The emission factors and methods in this guide are for sources common to many New Zealand organisations.

This guide, and the emission factors and methods, are not appropriate for a full life-cycle assessment or product carbon footprinting. These factors only include direct emissions from activities, and do not include all sources of emissions required for a full life-cycle analysis.

This information is not appropriate for use in an emissions trading scheme. Organisations required to participate in the New Zealand Emissions Trading Scheme (NZ ETS) need to comply with the scheme-specific reporting requirements. The NZ ETS regulations determine which emission factors and methods to use to calculate and report emissions.

Users seeking guidance on preparing a regional inventory should refer to the [GHG Protocol for Community-scale Greenhouse Gas Emission Inventories](#).

If emission factors relevant to your organisation are not included in *Measuring Emissions: A Guide for Organisations*, we suggest using alternatives such as those published by the UK government: [www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2018](http://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2018)

This guide covers the following greenhouse gases: carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulphur hexafluoride (SF<sub>6</sub>) and nitrogen trifluoride (NF<sub>3</sub>).<sup>1</sup>

GHGs can trap differing amounts of heat in the atmosphere, meaning they have different relative impacts on climate change. These are known as global warming potentials (GWPs).<sup>2</sup> To enable a meaningful comparison between the seven gases, GHG emissions are commonly expressed as carbon dioxide equivalent or CO<sub>2</sub>-e. This is used throughout the guide. For further information about GWPs, please see the [Detailed Guide](#) (section 1.3).

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<sup>1</sup> The *GHG Protocol* added NF<sub>3</sub> in 2013 as a requirement and *ISO 14064-1* included NF<sub>3</sub> in 2018. This is consistent with the national inventory.

<sup>2</sup> We use the 2007 IPCC GWPs to ensure consistency with the national inventory.

## 1.3. Standards to follow

We recommend following *ISO 14064-1:2018* and the *GHG Protocol Corporate Accounting and Reporting Standard*. We wrote this guide to align with both.

- *ISO 14064-1:2018*<sup>3</sup> is shorter and more direct than the *GHG Protocol*. A PDF copy costs 158 Swiss francs.
- The *GHG Protocol*<sup>4</sup> gives more description and context around what to do to produce an inventory. It is free to download.

Both standards give comprehensive guidance on the core issues of GHG monitoring and reporting at an organisational level, including:

- principles of monitoring and reporting
- setting organisational boundaries
- setting reporting boundaries
- establishing a base year
- managing the quality of a GHG inventory
- content of a GHG report.

### Scopes

The *GHG Protocol* places GHG emission sources into Scope 1, Scope 2 and Scope 3 activities.

- Scope 1: Direct emissions from sources owned or controlled by the organisation (ie, within the organisational boundary). For example, emissions from combustion of fuel in vehicles owned or controlled by the organisation.
- Scope 2: Indirect emissions from the generation of purchased energy (in the form of electricity, heat or steam) that the organisation uses.
- Scope 3: Other indirect emissions occurring because of the activities of the organisation but generated from sources it does not own or control (eg, air travel).

*ISO 14064-1:2018* categorises emissions as direct or indirect sources. This is to manage double counting of emissions (such as between an electricity generator's direct emissions associated with generation, and the indirect emissions linked to the user of that electricity).

Table 1 lists the scopes according to the type of emission, and the source categories.

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<sup>3</sup> Published by the International Organization for Standardization. This standard is closely based on the *GHG Protocol*.

<sup>4</sup> Developed jointly by the World Resources Institute (WRI) and the World Business Council for Sustainable Development (WBCSD).



**Table 1: Emissions by scope and source category**

Scope	Direct/indirect emissions	Source category	New for this guide?
Scope 1	Direct GHG emissions and removals <sup>5</sup>	Fuel	
		Refrigerant use	
		Agriculture, forestry and other land uses	Yes
Scope 2	Indirect GHG emissions from imported energy	Purchased energy	
Scope 3	Indirect GHG emissions from transportation	Business travel	Yes
		Freight transport	Yes
		Refrigerant use (from chilled transport or air conditioner)	
	Indirect GHG emissions from products an organisation uses	Transmission and distribution losses	
		Water supply and wastewater treatment	Yes
		Materials and waste	

Note: Depending on your organisation's reporting and financial boundaries, some emission sources may be either Scope 1 or Scope 3.

Currently for direct emissions, *ISO 14064-1:2018* requires that organisations report emissions by GHG as well as in carbon dioxide equivalents (CO<sub>2</sub>-e). Example calculations in this guide do so. For more information see the *Detailed Guide, Emission Factors Workbook* and *Interactive Workbook*.

<sup>5</sup> See *Glossary* for definitions.

## 2. How to quantify and report GHG emissions

To quantify and report GHG emissions, organisations need data about their activities (eg, quantity of fuel used). They can then convert this into information about their emissions (measured in tonnes of CO<sub>2</sub>-e) using emission factors.

**An emission factor** allows you to estimate emissions from a unit of activity data (eg, litres of fuel used). The factors are set out in the [Emission Factors Summary](#) and the [Emission Factors Workbook](#).

**A GHG inventory** contains all applicable emissions for an organisation within a defined boundary during a set period. The inventory is key to measuring emissions.

**A GHG report** (see section 2.3) provides context about the organisation, as well as analysis and progress. The report is key to communicating GHG-related information to its intended users.

Organisations that wish to be in line with [ISO 14064-1:2018](#) should be aware that the standard has specific requirements about what to include in the inventory and report.

You may opt to verify the GHG inventory or report against the measurement standards (see section 3). Although optional, this can give confidence that the inventory is accurate and complete, so organisations can effectively manage and reduce their emissions.

### 2.1. Step by step

To prepare an inventory:

1. Select the boundaries (organisational and reporting<sup>6</sup>) and measurement period (ie, calendar or financial year) you will report against for your organisation.
2. Collect activity data on each emission source within the boundaries for that period.
3. Multiply the quantity used by the appropriate emission factor in a spreadsheet. See [Example GHG Inventory](#).
4. Produce a GHG report, if applicable. See section 2.3 and [Example GHG Report](#).

If this is your first inventory, you can use it as a base year for measuring the change in emissions over time (as long as the scope and boundaries represent your usual operations, and that comparable reporting is used in future years).

For some organisations, certain GHG emissions may form less than 1 per cent of the inventory. These are known as *de minimis*<sup>7</sup> and may be excluded from the total inventory, provided that the total of excluded emissions does not exceed the materiality threshold. For example, if using a materiality threshold of 5 per cent, the total of all emission sources excluded as *de minimis* must not exceed 5 per cent of the inventory. Typically, an organisation estimates any

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<sup>6</sup> See [Glossary](#) for definitions.

<sup>7</sup> See [Glossary](#) for definition.

emissions considered *de minimis* using simplified methods to justify the classification. It is important these are transparently documented and justified. You only need to re-estimate excluded emissions in subsequent years if the assumptions change.

## 2.2. Using the emission factors

Emission factors rely on historical data. This 2019 guide is based on [New Zealand's Greenhouse Gas Inventory 1990-2016](#), as this was the latest complete set of data available.

If you use the [Interactive Workbook](#), input your activity data and the emission factors will be applied automatically. If you do not use the Interactive Workbook, example calculations are provided throughout chapter 4 to demonstrate how to use the emission factors.<sup>8</sup>

Organisations can choose to report on a calendar or financial year basis. The period determines which historical factors to use.

**Calendar year:** Use the latest published emission factors. For example, if you are reporting emissions for the 2018 calendar year, use this 2019 guide, which relies on 2016 data.

We published the previous guide in 2016, and there is a gap for the reporting period in 2017 and 2018. If you want to account for your 2017 or 2018 inventory, use this version (2019, the tenth iteration) as the next most appropriate and accurate source of emission factors.

**Financial year:** Use the guide that the greatest portion of your data falls within. For example, if you are reporting for the 2018/ 2019 financial year, use this 2019 guide. For a July to June reporting year, apply the more recent set of factors.

The emission factors in this guide are:

- default factors, used in the absence of better organisation- or industry-specific information
- consistent with the reporting requirements of [ISO 14064-1:2018](#) and the [GHG Protocol](#)
- aligned with [New Zealand's Greenhouse Gas Inventory 1990-2016](#). This also means we use the 2007 IPCC GWPs to ensure consistency.

See the [Detailed Guide](#) for further information.

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<sup>8</sup> Note that the emission factors in the example calculations within this document, the Emission Factors Summary and the Emission Factors Workbook are rounded. In the Interactive Workbook they are not. For this reason, you may notice small discrepancies between the answers in the example calculations and the answers provided in the Interactive Workbook.

## 2.3. Producing a GHG report

A full GHG report gives context to the GHG inventory by including information about the organisation, comparing annual inventories, discussing significant changes to emissions, listing excluded emissions, and stating the methods and references for the calculations.

### A GHG REPORT

To compile a full report, you need to include:

- a description of the organisation
- a description of the inventory boundaries
  - organisational boundary
  - reporting boundary
  - measurement period
- the chosen base year (initial period for comparing annual results)
- emissions for all seven GHGs separately in metric tonnes CO<sub>2</sub>-e
- emissions separated by scope
  - total Scope 1 and 2 emissions
  - specified Scope 3 emissions
- emissions from biologically sequestered carbon reported separately from the scopes
- a time series of emissions results from base year to present year
- significant emissions changes, including in the context of triggering any base year recalculations
- the methodology for calculating emissions, and references to key data sources
- any specific exclusion of sources, facilities or operations.

View an example reporting template on the *GHG Protocol Corporate Standard webpage*. See also the *Example GHG Report*.

## 3. Verification

Verification<sup>9</sup> gives confidence about the inventory and report. If you intend to publicly release the inventory, we recommend it is independently verified to confirm that calculations are accurate, the inventory is complete and you have followed the correct methodology.

### 3.1. Who should verify my inventory?

If you opt for verification, we recommend using verifiers who:

- are independent
- are members of a suitable professional organisation
- have experience with emissions inventories
- understand *ISO 14064* and the *GHG Protocol*
- have effective internal peer review and quality control processes.

Organisations may choose to use an accredited body to help them assess a verifier. For example, accreditation under the *ISO 14065* standard confirms that verifiers are suitably qualified and enables them to certify an inventory as being prepared in accordance with *ISO 14064-1:2018*.

In New Zealand, the Joint Accreditation System of Australia and New Zealand (JAS-ANZ) issues accreditations and publishes a list of accredited bodies on its website.<sup>10</sup>

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<sup>9</sup> See [Glossary](#) for definition.

<sup>10</sup> View accredited bodies on the JAS-ANZ Register at [www.jas-anz.org/accredited-bodies/all](http://www.jas-anz.org/accredited-bodies/all)



## 4. Calculating emissions by source category

The following sections aim to help organisations produce a GHG inventory. The Detailed Guide has information about category changes. For more information see the [Detailed Guide](#), [Example GHG Inventory](#) and [Interactive Workbook](#).

### 4.1. Fuel

The fuel category comprises stationary combustion and transport. It also includes the use of biofuels, and the transmission and distribution losses for reticulated natural gas.

In line with the reporting requirements of [ISO 14064-1:2018](#) and the [GHG Protocol](#), we provide emission factors for direct (Scope 1) sources to allow separate carbon dioxide, methane and nitrous oxide calculations.

Organisations typically report their fuel emissions using activity data on the amount of fuel used during the reporting period.

#### 4.1.1. Stationary combustion

Stationary combustion fuels are burnt in a fixed unit or asset, such as a boiler. To calculate these emissions, collect data on the quantity of fuel used (ie, litre or kilogram) during the reporting period and multiply this by the emission factor for each GHG.

Quantified units of fuel weight or volume (commonly in litres) are preferable.

#### STATIONARY COMBUSTION: EXAMPLE CALCULATION

An organisation uses 1400 kg of LPG to heat an office building in the reporting year.

CO <sub>2</sub> emissions	= 1,400 × 3.02	= 4,228 kg CO <sub>2</sub>
CH <sub>4</sub> emissions	= 1,400 × 0.00594	= 8.32 kg CO <sub>2</sub> -e
N <sub>2</sub> O emissions	= 1,400 × 0.00142	= 1.99 kg CO <sub>2</sub> -e
Total CO <sub>2</sub> -e emissions	= 1,400 × 3.03	= 4,242 kg CO <sub>2</sub> -e

Note: Numbers may not add due to rounding.

#### 4.1.2. Transport fuels

Transport fuels are used in an engine to move a vehicle. To calculate transport fuel emissions, collect data on the quantity of fuel used (ie, litres or gigajoules/GJ) and multiply this by the emission factors for each GHG.

Quantified units of fuel weight or volume (commonly in litres) are preferable.

## TRANSPORT FUELS: EXAMPLE CALCULATION

An organisation has 15 petrol vehicles. They use a total of 40,000 litres of regular petrol in the reporting year.

CO <sub>2</sub> emissions	= 40,000 × 2.35	= 94,000 kg CO <sub>2</sub>
CH <sub>4</sub> emissions	= 40,000 × 0.0276	= 1,103 kg CO <sub>2</sub> -e
N <sub>2</sub> O emissions	= 40,000 × 0.0797	= 3,186 kg CO <sub>2</sub> -e
Total CO <sub>2</sub> -e emissions	= 40,000 × 2.45	= 98,000 kg CO <sub>2</sub> -e

Note: Numbers may not add due to rounding

### 4.1.3. If no fuel data is available

If your records only state kilometres travelled, and you do not have information on fuel use, see section 4.4 [Travel](#). Factors such as individual vehicle fuel efficiency and driving efficiency mean that kilometre-based estimates of carbon dioxide equivalent emissions are less accurate than calculating emissions based on fuel-use data. Therefore, only use the emission factors based on distance travelled if you have no information on fuel use.

Calculating transport fuel based on dollars spent is less accurate and currently only applies to taxis. See section 4.4.1 [Passenger vehicles](#).

### 4.1.4. Biofuels and biomass emission factors

This category is a new addition in this 2019 guide. It gives emission factors for bioethanol and biodiesel and wood emission sources, previously listed in stationary combustion. For more information about biofuels, see the [Detailed Guide](#).

The carbon dioxide emitted from the combustion of biofuels and biomass (including wood) is biogenic, meaning it equates to the carbon dioxide absorbed by the feedstock during its lifespan. This means we treat the carbon dioxide portion of the combustion emissions of biofuels as carbon neutral. However, organisations should still report the carbon dioxide released through biofuel and biomass combustion. Calculate these emissions in the same way as the direct emissions. Then, instead of including them in the emissions total, list them in a separate line item called 'outside of scopes'.<sup>11</sup> This ensures the organisation is transparent about all potential sources of carbon dioxide from its activities.

To calculate biofuel emissions, collect data on the quantity of fuel used (litres) and multiply this by the emission factors for each gas.

<sup>11</sup> [https://ghgprotocol.org/sites/default/files/Stationary\\_Combustion\\_Guidance\\_final\\_1.pdf](https://ghgprotocol.org/sites/default/files/Stationary_Combustion_Guidance_final_1.pdf)

## BIOFUELS: EXAMPLE CALCULATION

An organisation uses 100 per cent biofuel in five vehicles. They use 7000 litres of biodiesel in the reporting year.

CO <sub>2</sub> emissions	= 7,000 × 2.45	= 17,150 kg CO <sub>2</sub> -e
CH <sub>4</sub> emissions	= 7,000 × 0.000104	= 0.728 kg CO <sub>2</sub> -e
N <sub>2</sub> O emissions	= 7,000 × 0.0000208	= 0.146 kg CO <sub>2</sub> -e
Total CO <sub>2</sub> -e emissions	= 7,000 × 0.000125	= 0.875 kg CO <sub>2</sub> -e

Note: Numbers may not add due to rounding.

An organisation wants to report on its Scope 1 fuel emissions (in kg CO<sub>2</sub>-e/litre) from a specific biodiesel blend of 10 per cent. It is known that:

mineral diesel conversion factor	= 2.69 kg CO <sub>2</sub> -e/litre
biodiesel conversion factor	= 0.000125 kg CO <sub>2</sub> -e/litre

Therefore, 10 per cent biodiesel blend conversion factor =

$$(10\% \times 0.000125) + [(1-10\%) \times 2.69] = 2.42 \text{ kg CO}_2\text{-e/litre biofuel blend}$$

### 4.1.5. Transmission and distribution losses for reticulated gases

Reticulated gases are delivered via a piped gas system. Users should be aware what type of reticulated gas they are receiving: natural gas or liquefied petroleum gas (LPG).

Reticulated LPG is supplied in Canterbury only. LPG does not contain any methane so fugitive emissions (ie, leaks) of methane do not occur.

To calculate the emissions from transmission and distribution losses, collect data on the quantity of natural gas used in the unit expressed and multiply this by the emission factors for each gas.

## RETICULATED GAS: EXAMPLE CALCULATION

An organisation uses 800 gigajoules of distributed natural gas in the reporting period.

CO <sub>2</sub> emissions	= 800 × 0.00	= 0 kg CO <sub>2</sub>
CH <sub>4</sub> emissions	= 800 × 6.34	= 5,072 kg CO <sub>2</sub> -e
N <sub>2</sub> O emissions	= 800 × 0.00	= 0 kg CO <sub>2</sub> -e
Total CO <sub>2</sub> -e emissions	= 800 × 6.34	= 5,072 kg CO <sub>2</sub> -e

Note: Numbers may not add due to rounding.

## 4.2. Refrigerant use

GHG emissions from hydrofluorocarbons (HFCs) are associated with unintentional leaks and spills from refrigeration units, air conditioners and heat pumps. Quantities of HFCs in a GHG inventory may be small, but HFCs have very high GWPs (commonly 1300 to 3300 times more potent than carbon dioxide) so emissions from this source may be material. Refrigerant gases come under the Montreal and Kyoto protocols. You can find more information in the [Detailed Guide](#).

Calculate emissions from refrigerants based on estimated leakage from equipment. The equipment maintenance service provider can typically provide the actual amounts used to top up equipment (ie, to replace what has leaked). There are three approaches to estimate HFC leakage from equipment, depending on data available. See the *Detailed Guide* (chapter 4 and appendix B) for further information on methods B and C.

If you consider it likely that emissions from refrigerant equipment and leakage is a significant proportion of your total emissions (ie, more than 5 per cent), you should include them in your GHG inventory. You may need to carry out a screening test to determine if this is a material source.

If you own or control the refrigeration units, emissions from refrigeration are direct (Scope 1). If the unit is leased, they are indirect (Scope 3).

To calculate the emissions from refrigerant use, collect data on the quantity of refrigerant used to top up equipment and multiply this by the emission factors. If this data is not available, please see the *Detailed Guide* for alternative methods.

#### REFRIGERANT USE: EXAMPLE CALCULATIONS

##### Method A: Top-up

**Chiller unit:** During the 2018 calendar year, a service technician confirmed a top-up of 6 kg of HFC-134a in December 2018. The technician also confirmed that when last serviced at the end of December 2017, no top-ups were needed. So we assume all the gas was lost during calendar year 2018.

So, for the 2018 inventory:

$$6 \text{ kg HFC-134a} \times \text{EF } 1,430 = 8,580 \text{ kg CO}_2\text{e}$$

**Air conditioning unit:** During the 2018 calendar year, a service technician confirmed a top-up of 6 kg of HFC-143a in July 2018. The technician also confirmed that when last serviced at the end of July 2017, no top-ups were needed. So we assume all the gas was lost at an even rate during the 12 months between service visits, and six of those months sit in the 2018 measurement period.

$$6 \text{ kg} / 12 \text{ months} = 0.5 \text{ kg per month}$$

So, for the 2018 calendar year inventory,  $0.5 \times 6 \text{ months} = 3 \text{ kg}$ . Emissions calculate as:

$$3 \text{ kg HFC-143a} \times \text{EF } 4,470 = 13,410 \text{ kg CO}_2\text{e}$$

### 4.3. Purchased electricity, heat and steam

Purchased energy, in the form of electricity, heat or steam, is an indirect (Scope 2) emission. This section also includes transmission and distribution losses for purchased electricity, which is an indirect (Scope 3) source.

### 4.3.1. Direct emissions from purchased electricity from New Zealand grid

This guide applies to electricity purchased from a supplier that sources electricity from the national grid (ie, purchased electricity consumed by end users). It does not cover on-site, self-generated electricity.

We calculate purchased electricity emission factors on a calendar-year basis and based on the average grid mix of generation types for the 2016 year. The emission factor accounts for the emissions from fuel combustion at thermal power stations and fugitive geothermal emissions. Thermal electricity is generated by burning fossil fuels. Renewable generation such as hydro, wind and solar has no associated combustion or fugitive GHG emissions.

The grid-average emission factor best reflects the carbon dioxide equivalent emissions associated with the generation of a unit of electricity purchased from the national grid in New Zealand in 2018. A grid average emission factor doesn't reflect the real-world factors that influence the carbon intensity of the grid, such as time of year, time of day and geographical area. Therefore, a grid-average emission factor may over- or underestimate the GHG emissions from your organisation.

To calculate the emissions from purchased electricity, collect data on the quantity of electricity used during the period in kilowatt hours (kWh) and multiply this by the emission factor for each gas.

#### PURCHASED ELECTRICITY: EXAMPLE CALCULATION

An organisation uses 800,000 kWh of electricity in the reporting period. Its indirect (Scope 2) emissions from electricity are:

CO <sub>2</sub> emissions	= 800,000 × 0.0932	= 74,560 kg CO <sub>2</sub> -e
CH <sub>4</sub> emissions	= 800,000 × 0.00439	= 3,512 kg CO <sub>2</sub> -e
N <sub>2</sub> O emissions	= 800,000 × 0.0000861	= 68.9 kg CO <sub>2</sub> -e
Total CO <sub>2</sub> -e emissions	= 800,000 × 0.0977	= 78,160 kg CO <sub>2</sub> -e

Note: Numbers may not add due to rounding.

### 4.3.2. Transmission and distribution losses for electricity

Additional electricity must be generated to make up for that lost in the transmission and distribution network. This emission factor accounts for that extra generation. Under the *GHG Protocol*, end users should report emissions from electricity consumed due to transmission and distribution losses as an indirect (Scope 3) source.

To calculate the emissions from transmission and distribution losses for purchased electricity, collect data on the kWh of electricity used in the reporting period and multiply this by the emission factor for each gas.



## TRANSMISSION AND DISTRIBUTION LOSSES: EXAMPLE CALCULATION

An organisation uses 800,000 kWh of electricity in the reporting period. Its indirect (Scope 3) emissions from transmission and distribution losses for purchased electricity are:

CO <sub>2</sub> emissions	= 800,000 × 0.00706	= 5,648 kg CO <sub>2</sub> -e
CH <sub>4</sub> emissions	= 800,000 × 0.000333	= 266.4 kg CO <sub>2</sub> -e
N <sub>2</sub> O emissions	= 800,000 × 0.00000653	= 5.22 kg CO <sub>2</sub> -e
Total CO <sub>2</sub> -e emissions	= 800,000 × 0.00740	= 5,920 kg CO <sub>2</sub> -e

Note: Numbers may not add due to rounding.

### 4.3.3. Imported heat and steam

Organisations that have a specific heat or steam external energy source (such as a district heating scheme) can calculate emissions using an emission factor specific to that scheme. This should be available from the owner of the external source.

### 4.3.4. Geothermal energy

Organisations that have their own geothermal energy source can calculate emissions separately using a unique emission factor. Depending on the steam coming from the borehole, there may or may not be emissions associated with this energy type.

## 4.4. Travel

Travel emissions result from travel associated with (and generally paid for by) the organisation. We provide factors for private and rental vehicles, taxis, public transport, air travel and accommodation.

Travel emissions are indirect (Scope 3) if you do not directly own or control the vehicles used for travel. If you own or have an operating lease for the vehicle, these emissions are direct (Scope 1) and should be accounted for in transport fuels (see section 4.1.2).

### 4.4.1. Passenger vehicles

This section covers emissions from private vehicle mileage claims, rental vehicles and taxi travel.

Organisations should gather the data on passenger vehicles with as much detail as possible, including age of the vehicle, engine size, fuel type and kilometres travelled. If information is not available, we provide conservative defaults to allow for over- rather than underestimation.

**If fuel use data is available**, see section 4.1.2 on transport fuels.

**If fuel use data is not available**, collect data on the kilometres travelled by vehicle type, and multiply this by the emission factors based on distance travelled for each GHG.

## PASSENGER VEHICLES: EXAMPLE CALCULATION

An organisation has 15 petrol vehicles. They use 40,000 litres of regular petrol in the reporting period.

CO <sub>2</sub> emissions	= 40,000 × 2.35	= 94,000 kg CO <sub>2</sub>
CH <sub>4</sub> emissions	= 40,000 × 0.0276	= 1,104 kg CO <sub>2</sub> -e
N <sub>2</sub> O emissions	= 40,000 × 0.0797	= 3,188 kg CO <sub>2</sub> -e
Total CO <sub>2</sub> -e emissions	= 40,000 × 2.45	= 98,000 kg CO <sub>2</sub> -e

An organisation owns three pre-2010 petrol hybrid vehicles. They are all between 1600 and 2000 cc and travel a total of 37,800 km in the reporting period.

CO <sub>2</sub> emissions	= 37,800 × 0.171	= 6,464 kg CO <sub>2</sub>
CH <sub>4</sub> emissions	= 37,800 × 0.002	= 76 kg CO <sub>2</sub> -e
N <sub>2</sub> O emissions	= 37,800 × 0.006	= 227 kg CO <sub>2</sub> -e
Total CO <sub>2</sub> -e emissions	= 37,800 × 0.178	= 6,728 kg CO <sub>2</sub> -e

An organisation uses petrol rental cars to travel 12,000 km in 2018. It also spends \$18,000 on taxi travel.

Total CO <sub>2</sub> -e emissions from rental cars	= 12,000 × 0.207	= 2,484 kg CO <sub>2</sub> -e
Total CO <sub>2</sub> -e emissions from taxi travel	= \$18,000 × 0.0747	= 1,345 kg CO <sub>2</sub> -e

Note: Numbers may not add due to rounding.

### 4.4.2. Public transport vehicles

Public transport emissions include those from buses. [Air travel](#) is in a separate section below. No data is currently available on ferry and commuter rail travel.

**Buses:** There are currently no emission factors for transport per passenger kilometre (pkm). For an inventory, this category is usually *de minimis* and therefore will not typically affect the inventory. However, it is possible to calculate the emissions from the whole vehicle.

To calculate emissions, collect data on the type of bus used (if available) and distance travelled, and multiply this by the emission factors for each gas.

## DIESEL BUS: EXAMPLE CALCULATION

An organisation charters a diesel bus (<7500 kg) to travel 500 km. The emissions would be:

$$\text{Total CO}_2\text{-e emissions from bus travel} = 500 \times 0.566 = 283 \text{ kg CO}_2\text{-e}$$

This result is for the entire bus.

### 4.4.3. Air travel (domestic and international)

To calculate emissions for air travel, collect information on passengers flying, their departure airport and destination airport, and if practical, the size of the plane. For international travel, note the class of travel if possible. Calculate distances using online calculators such as [www.airmilescalculator.com](http://www.airmilescalculator.com). Multiply the number of passengers by the distance travelled to obtain the passenger kilometre (pkm). Collect data on the pkm by class in the reporting period.



For the two people who travel economy class:

Person kilometres travelled =  $2 \times 9,346 \times 2 = 37,384$  pkm

Their CO<sub>2</sub>-e emissions from air travel =  $37,384 \times 0.163 = 6,093.6$  kg CO<sub>2</sub>-e

For the three people with unknown travel classes:

Person kilometres travelled =  $3 \times 9,346 \times 2 = 56,076$  pkm

Their CO<sub>2</sub>-e emissions from air travel =  $56,076 \times 0.213 = 11,944.2$  kg CO<sub>2</sub>-e

Total CO<sub>2</sub>-e emissions from international air travel =  $6,094 + 11,944 = 18,038$  kg CO<sub>2</sub>-e

Note: Numbers may not add due to rounding.

#### 4.4.4. Accommodation

To calculate emissions from accommodation during business trips, collect data on the number of rooms booked, the number of nights and the country visited.

##### ACCOMMODATION: EXAMPLE CALCULATION

An organisation sends six people to a conference in Australia. They book three rooms for four nights.

Total CO<sub>2</sub>-e emissions from the hotel stay =  $3 \times 4 \times 65.1 = 781.2$  kg CO<sub>2</sub>-e

### 4.5. Freight transport

Emissions from freight transport are indirect (Scope 3) for businesses freighting goods through a third party. We provide emission factors for freighting goods, in tonne kilometres (tkm), and for the actual freight vehicles (in km). The emission factors include freighting goods via road, rail, domestic coastal shipping, international shipping and air freight. We also provide emission factors (in km) for road light commercial vehicles and heavy goods vehicles.

#### 4.5.1. Road freight

If you use freight vehicles, you can calculate the emissions from the kilometres travelled by that vehicle (sorted by age, engine size and fuel type).

For freighting goods emissions, you need to know the weight in tonnes of the goods freighted, and the distance in kilometres travelled.

#### 4.5.2. Rail freight

Calculate the weight of goods freighted (tonnes) and multiply this by the kilometres travelled.

#### 4.5.3. Air freight

Organisations should collect data on the weight (tonnes) of goods freighted by air, and the distance travelled (kilometres).

#### 4.5.4. Coastal and international shipping freight

Organisations can calculate emissions for both coastal shipping in New Zealand and international shipping. The international shipping emission factors consider the ship types that visit New Zealand.

Collect data on the weight (tonnes) of goods freighted, and the distance (kilometres) travelled. For each journey, multiply the total weight by the total distance travelled. See the [Detailed Guide](#) for more example calculations.

##### MULTIPLE FREIGHT MODES: EXAMPLE CALCULATION

A company sends 300 kg of its product to a customer. The product travels 50 km to the port by road freight, then 500 km by coastal shipping to another domestic port. It then travels by rail to its destination 250 km from the port.

Road freight emissions:

$$\begin{aligned} 0.3 \text{ tonnes} \times 50 \text{ km} &= 15 \text{ tkm} \\ 15 \text{ tkm} \times 0.136 &= 2.04 \text{ kg CO}_2\text{-e} \end{aligned}$$

Coastal shipping emissions:

$$\begin{aligned} 0.3 \text{ tonnes} \times 500 \text{ km} &= 150 \text{ tkm} \\ 150 \text{ tkm} \times 0.045 &= 6.75 \text{ kg CO}_2\text{-e} \end{aligned}$$

Rail freight emissions:

$$\begin{aligned} 0.3 \text{ tonnes} \times 250 \text{ km} &= 75 \text{ tkm} \\ 75 \text{ tkm} \times 0.028 &= 2.1 \text{ kg CO}_2\text{-e} \end{aligned}$$

Total freight emissions:

$$2.04 + 6.75 + 2.1 = 10.89 \text{ kg CO}_2\text{-e}$$

Note: Numbers may not add due to rounding.

## 4.6. Water supply and wastewater treatment

Emissions result from energy use in water supply and wastewater treatment plants. Some plants also generate emissions when treating organic matter. Emissions from the supply of water and wastewater treatment are indirect GHG emissions (Scope 3) if the organisation does not own or control the facilities.

### 4.6.1. Water supply

Users should collect data on cubic metres (m<sup>3</sup>) of water used, if it is available. If it is not, apply the per capita emission factor. This is based on an average of water consumed by one person per year, and is less accurate.



## WATER SUPPLY: EXAMPLE CALCULATION

An organisation's assets have water meters. Throughout the reporting year they use 1000 m<sup>3</sup> of water.

CO <sub>2</sub> emissions	= 1,000 × 0.0299	= 29.9 kg CO <sub>2</sub>
CH <sub>4</sub> emissions	= 1,000 × 0.0014	= 1.4 kg CO <sub>2</sub> -e
N <sub>2</sub> O emissions	= 1,000 × 0.00003	= 0.03 kg CO <sub>2</sub> -e
Total CO <sub>2</sub> -e emissions	= 1,000 × 0.0313	= 31.3 kg CO <sub>2</sub> -e

Note: Numbers may not add due to rounding.

### 4.6.2. Wastewater

We converted energy use (kWh) to GHG emissions and added these to the treatment process emissions to give the total emissions from wastewater treatment in New Zealand. We provide emission factors for centralised wastewater treatment plants, septic tanks and specific manufacturing industries that produce wastewater that is particularly high in biological oxygen demand (BOD): meat, poultry, pulp and paper, wine, and dairy.

Collect data on the amount of water supplied, similar to measuring water supply emissions. Septic tank calculations require the number of people using the septic tank during that reporting year. Industrial users in the above categories should use the specific emission factors provided.

## WASTEWATER: EXAMPLE CALCULATION

During the reporting period an organisation uses 100 m<sup>3</sup> of water in its offices. They assume that all water is also sent to be treated. This organisation also owns a winery that crushes 10 tonnes of grapes during the reporting period.

The office wastewater is domestic, therefore:

CO <sub>2</sub> emissions	= 100 × 0.077	= 7.7 kg CO <sub>2</sub>
CH <sub>4</sub> emissions	= 100 × 0.151	= 15.1 kg CO <sub>2</sub> -e
N <sub>2</sub> O emissions	= 100 × 0.218	= 21.8 kg CO <sub>2</sub> -e
Total CO <sub>2</sub> -e emissions	= 100 × 0.447	= 44.7 kg CO <sub>2</sub> -e

Note: Numbers may not add due to rounding

The winery wastewater is industrial wastewater (wine), therefore:

CO <sub>2</sub> emissions	= n/a	
CH <sub>4</sub> emissions	= 10 × 5.17	= 51.7 kg CO <sub>2</sub> -e
N <sub>2</sub> O emissions	= n/a	
Total CO <sub>2</sub> -e emissions	= 10 × 5.17	= 51.7 kg CO <sub>2</sub> -e

Note: Numbers may not add due to rounding

The total wastewater emissions are:

$$44.7 + 51.7 = 96.4 \text{ kg CO}_2\text{-e}$$

Note: Numbers may not add due to rounding.

## 4.7. Materials and waste

### 4.7.1. Construction materials

Construction materials emissions are based on best-available New Zealand data for three core materials: concrete, steel and aluminium. These emissions are indirect (Scope 3) if the organisation does not own or control the facilities making the materials.

Users should collect data on the quantity of construction materials used (kg).

#### CONSTRUCTION MATERIALS: EXAMPLE CALCULATION

An organisation builds a shelter with concrete foundations during the reporting period. They use 300 kg of concrete and do not know its tensile strength, so apply the default value.

$$\text{Total CO}_2\text{-e emissions} = 300 \times 0.148 = 44.4 \text{ kg CO}_2\text{-e}$$

Note: Numbers may not add due to rounding.

### 4.7.2. Waste disposal

This section will help organisations calculate emissions from waste sent to a landfill. It does not include emissions from other waste processes (eg, recycling).

To calculate waste emissions, you need to know the type of landfill and the composition of the waste (if possible).

**Knowing the type of landfill** ensures that methane is appropriately counted. Organic waste produces significant amounts of methane as it decomposes. Some landfills have systems to collect and destroy this gas before it can reach the atmosphere (you can find which landfills have these systems in the *Detailed Guide's* appendix A). By selecting the appropriate emissions factor the emissions inventory will account for if the landfill gas is destroyed.<sup>14</sup>

**If the type of landfill is unknown**, use the emission factor for 'without gas recovery', which will give a more conservative estimate.

**Knowing the composition and weight (in kg) of waste** allows you to accurately quantify GHG emissions. Use the known weight of waste to calculate a more accurate emissions footprint.

**If the waste composition is unknown**, you can select 'general waste' or 'office waste'. 'General waste' assumes the waste matches the national composition average for mixed municipal waste. 'Office waste' should be used by office-based organisations as it reflects their higher proportion of organic matter (eg, paper and food).

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<sup>14</sup> When methane is recovered and flared or combusted for energy, the carbon dioxide emitted from the combustion process is regarded as part of the natural carbon cycle.

## WASTE DISPOSAL: EXAMPLE CALCULATION

A hotel produces waste in its kitchen, guest rooms and garden. They send this waste to the regional landfill, which is known to have gas recovery.

If the waste comprises 150 kg food waste, 50 kg general waste from guest rooms and 60 kg of garden waste, the hotel calculates emissions as follows:

Food waste	= 150 × 0.233	= 34.9 kg CO <sub>2</sub> -e
General waste	= 50 × 0.242	= 12.1 kg CO <sub>2</sub> -e
Garden waste	= 60 × 0.310	= 18.6 kg CO <sub>2</sub> -e
Total waste emissions	= 34.9 + 12.1 + 18.6	= 65.6 kg CO <sub>2</sub> -e

Note: Numbers may not add due to rounding.

## 4.8. Agriculture, forestry and other land use

This is a new category for the tenth version of this guide. It covers emissions produced by land use, land-use change and forestry (LULUCF), enteric fermentation of livestock, manure management and fertiliser use. Including these sources is in line with *New Zealand's Greenhouse Gas Inventory 1990-2016*.

Emissions from agriculture, forestry and land use are produced in several ways.

- Methane is a by-product of digestion in ruminants such as cattle and sheep, which are the largest sources of methane in this sector.
- Storing and treating manure, and spreading it onto pasture, produces methane and nitrous oxide.
- Applying nitrogen (urea sourced or synthetic) fertiliser onto land produces nitrous oxide and carbon dioxide emissions.
- Applying lime and dolomite fertilisers results in carbon dioxide emissions.
- Land use can result in removals (forests help remove carbon dioxide from the atmosphere) or emissions (harvesting and deforestation).

If an organisation directly owns and manages livestock, these are direct GHG emissions (Scope 1). LULUCF emissions are reported separately from direct and indirect GHG emissions (Scope 1, 2 and 3).

Alternative tools, such as OVERSEER, can estimate the GHG emissions from agricultural processes but the results will differ from those generated in this guide (eg, *Interactive Workbook*). This is because these emission factors have inbuilt assumptions and limitations that may differ from alternative tools.<sup>15</sup> It is up to the user to assess the appropriateness of emission factors when comparing those from the guide with those from alternative tools.

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<sup>15</sup> The livestock emissions you calculate using these emission factors are intended to be an approximate estimate of emissions only, and are based on the average per-animal biological emissions of New Zealand's main farmed livestock types in 2016. Actual animal emissions for an individual farm will differ depending on a number of factors, including live-weights, productivity, and feed quality. Organisations looking for a more accurate estimate of their agricultural emissions are encouraged to use tools such as Overseer.

### 4.8.1. Land use, land-use change and forestry (LULUCF)

GHG emissions from vegetation and soils that are due to human activities are reported in the land use, land-use change and forestry (LULUCF) sector. This guide provides emission factors related to forest growth, forest harvest and deforestation only. The term LULUCF is used for consistency with the national inventory.

The LULUCF sector is responsible for both emitting GHG to the atmosphere (emissions ie, through harvesting and deforestation) and removing GHG from the atmosphere (removals ie, through vegetation growth and increasing organic carbon stored in soils). Most emissions reported in the LULUCF sector are due to forestry activities, such as harvesting in production forests. Most removals are due to forest growth. When emissions exceed removals, LULUCF is a 'net source' and emissions are positive. When removals exceed emissions, LULUCF is a 'net sink' and emissions are negative.

In line with *ISO 14064-1:2018* and the *GHG Protocol*, organisations should consider LULUCF emissions if they have forested land within their measurement boundary, or own land that has been deforested for timber or other reasons during the measurement period.

Organisations with LULUCF emissions should calculate and report these separately from direct and indirect GHG emissions (Scope 1, 2 and 3). In the case that LULUCF is a net sink however (ie, net emissions are negative), you should subtract the total from the other emissions – a practice known as offsetting.

In New Zealand, most LULUCF emissions reported at the national scale result from forestry. This guide provides methods for estimating carbon stock changes that occur in forest vegetation. The emission factors provided in this guide are New Zealand-specific emission factors, derived from national averages.

Land-use definitions and further details on the LULUCF sector can be found in the *Detailed Guide*.

To calculate LULUCF emissions, you need activity data on each forest type (planted, tall natural or regenerating natural – see section 10.2.3 in the *Detailed Guide* for definitions), the area harvested (in hectares, ha) and any changes to forested land within the organisational boundary for the measurement period. Remember that negative emissions are a carbon sink and you can apply them to the total inventory as offsets.

Sources for this information could include:

1. Corporate or farm records for enterprises and organisations.
2. Geospatial analysis of the property or region.
3. The *LUCAS Land Use Map*<sup>16</sup> can provide area by vegetation type at 1990, 2008, 2012 and 2016. It requires geospatial expertise to analyse and extract the data by region. This is free to use and supports users in monitoring changes in their own land management practices.

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<sup>16</sup> Land Use Carbon Analysis System (LUCAS) Land Use Map available at <https://data.mfe.govt.nz/>

4. The New Zealand Land Cover Database (LCDB)<sup>17</sup> provides multi-temporal land cover. It requires geospatial expertise to analyse and extract the data for sub-national analysis.

#### LAND USE, LAND-USE CHANGE AND FORESTRY: EXAMPLE CALCULATION

An organisation owns 4 ha of land. 3 ha are planted forest and 1 ha is regenerating natural forest. During the reporting year the organisation harvested the planted forest for timber.

3 ha of planted forest were harvested, therefore:

$$\text{CO}_2 \text{ emissions} = 3 \times 946,605 = 2,839,815 \text{ kg CO}_2$$

The emissions for the regenerating natural forest are:

$$\text{CO}_2 \text{ emissions} = 1 \times -5,097 = -5,097 \text{ kg CO}_2$$

Therefore, total net CO<sub>2</sub>-e emissions = 2,839,815 – 5,097 = 2,834,718 kg CO<sub>2</sub>-e.

Note: Negative emissions are a carbon sink.

### 4.8.2. Enteric fermentation

Enteric fermentation is the process by which ruminant animals produce methane through digesting feed. We provide emission factors for dairy cattle, non-dairy cattle, sheep and deer.

To calculate these emissions, collect data on the number and type of livestock as at 30 June during the measurement period (regardless of whether it is a calendar or financial year – see *Detailed Guide* section 10.3.1 for more information).

#### ENTERIC FERMENTATION: EXAMPLE CALCULATION

An organisation owns 30 sheep and six dairy cows on 30 June during the reporting period. They graze on land owned by the organisation.

CO <sub>2</sub> emissions	= 0
CH <sub>4</sub> emissions	= (30 × 300) + (6 × 2,060) = 21,360 kg CO <sub>2</sub> -e
N <sub>2</sub> O emissions	= 0
Total CO <sub>2</sub> -e emissions	= 21,360 kg CO <sub>2</sub> -e

Note: Numbers may not add due to rounding.

### 4.8.3. Manure management

Manure management refers to the process of managing the excretion of livestock, particularly when they are not on paddocks. Manure storage and treatment produces GHG emissions. We provide emission factors for dairy cattle, non-dairy cattle, sheep and deer.

To calculate these emissions, collect data on the number and type of livestock as at 30 June during the measurement period (regardless of whether it is a calendar or financial year – see *Detailed Guide* section 10.3.2 for more information).

<sup>17</sup> LCDB available at <https://iris.scinfo.org.nz/layer/48423-lcdb-v41-land-cover-database-version-41-mainland-new-zealand/>



# Glossary

Activity data	Data on the magnitude of human activity resulting in emissions or removals taking place during a given period
Base year	The first year in the reporting series
Biodiesel	A type of biofuel similar to diesel that is made from natural elements such as plants, vegetables, and reusable materials
Bioethanol	A type of biofuel similar to ethanol that is made from natural elements such as plants, vegetables, and reusable materials
Biofuels	Any fuel derived from biomass
BOD	Biological oxygen demand, the amount of dissolved oxygen needed by micro-organisms to break down biological organic matter in water
Biologically sequestered carbon	The removal of carbon dioxide from the atmosphere and captured by plants and micro-organisms
Carbon sink	A natural or artificial environment that absorbs and stores carbon from the atmosphere
CO <sub>2</sub> -e	Carbon dioxide equivalent
<i>De minimis</i>	An issue that is insignificant to a GHG inventory, usually <1% of an organisation's total inventory for an individual emission source. Often there is a limit to the number of emission sources that can be excluded as <i>de minimis</i>
Deforestation	The clearing <del>(of)</del> <del>of</del> <del>the</del> <del>land</del> <del>area</del> <del>of</del> <del>the</del> <del>land</del> <del>area</del>
Emission factor	The average emission rate of a given GHG for a given source, relative to units of activity
Enteric fermentation	The process by which ruminant animals digest feed and produce methane
Fugitive emissions	The emission of gases from pressurised equipment due to leaks or unintended releases of gases, usually from industrial activities
GHG	Greenhouse gas
GHG inventory	A quantification of an organisation's greenhouse gas sources, sinks, emissions and removals
GHG Protocol	The <i>Greenhouse Gas Protocol Accounting and Reporting Standard</i> provides guidance for organisations preparing a GHG inventory
GHG report	A standalone report to communicate an organisations GHG-related information to intended users
GJ	Gigajoule (unit of measure, one billion joules)
GWP	Global warming potential, a factor describing the radiative forcing impact of one mass-based unit of a given GHG relative to an equivalent unit of carbon dioxide over a given period (typically 100 years)
HFC	Hydroflurocarbon, an alternative refrigerant gas that minimises damage to the ozone hole
ISO 14064-1:2018	International Organization for Standardization standard on greenhouse gases - Part 1: Specification with guidance at the organization level for quantification and reporting greenhouse gas emissions and removals
LULUCF	Land use, land-use change and forestry



<b>Materiality</b>	To be considered as having significance to an organisation
<b>National inventory</b>	<i>New Zealand's Greenhouse Gas Inventory 1990-2016</i>
<b>Organisational boundary</b>	The boundary of the organisation as it applies to measurement of GHG emissions. This typically aligns with legal and/or organisational structure; a financial boundary must be drawn within this too
<b>OVERSEER</b>	A New Zealand software platform that enables farmers and growers to estimate and improve nutrient use on farms
<b>pkm</b>	Passenger-kilometre (unit of measure for transport)
<b>Radiative forcing</b>	The difference between solar energy absorbed by the Earth and that radiated back to space. Human activity has impacts which alter radiative forcing
<b>Refrigerants</b>	A substance or mixture used in a heat pump and refrigeration cycle
<b>Removals</b>	Withdrawal of a GHG from the atmosphere by GHG sinks
<b>Reporting boundary</b>	The grouping of emission sources included within the organisational boundary, including direct and indirect emission sources. It includes choosing which indirect emission sources to report
<b>Reticulated gas</b>	A piped gas system to deliver a gas such as LPG or natural gas to a consumer
<b>Scope</b>	Emission sources are categorised by scope to manage risks and impacts of double counting. There are three scopes in greenhouse gas reporting: Scope 1 (direct emissions), Scope 2 (energy indirect emissions) and Scope 3 (other indirect emissions)
<b>Stationary combustion fuel</b>	Fuel used in an unmoving engine, eg, a power plant or boiler
<b>tkm</b>	Tonne-kilometre (unit of measure for freight)
<b>Unique emission factor</b>	A value given to an activity based on how emissions intensive it is. Experienced professionals must verify a unique emission factor. See Climate Change (Unique Emissions Factors) Regulations 2009 for further information
<b>Uplift factor</b>	Applied to take into account the combined 'real-world' effects on fuel consumption (such as non-direct flight paths)
<b>Forest land</b>	Land containing tree species that will reach a height of at least 5 meters, with a canopy cover of at least 30% and be of at least 1 hectare in size