

MAY 22

GREENHOUSE GAS INVENTORY

CARTERTON DISTRICT COUNCIL - 2021



TE KAUNIHERA-Ā-ROHE O TARATAHI
CARTERTON
DISTRICT COUNCIL

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1 Summary

Note #1: Emission factors (EF) released by MfE are used in the greenhouse gas inventory.

Note #2: The district was in lock down level 3 and 4 between the 23rd of March 2020 and 14th May 2020 and between the 17th of August 2021 and the 7th September 2021 due to Covid-19 pandemic.

	Scope	t Co ₂ e - 2018	t Co ₂ e - 2019	t Co ₂ e - 2020	t Co ₂ e - 2021
CORPORATE SERVICES		11.79	12.42	13.00	12.85
<i>Electricity</i>	Scope 2	2.99	2.92	3.07	3.15
<i>T&D losses¹</i>	Scope 3	0.23	0.25	0.26	0.29
<i>Transport - Diesel</i>	Scope 1	0	0	0	0
<i>Transport - Petrol</i>	Scope 1	7.50	7.89	8.06	7.59
<i>Transport - Flights</i>	Scope 3	0.60	0.75	0.83	0.87
<i>Office waste Uncertainty: +/- 40%</i>	Scope 3	0.48	0.61	0.78	0.95
<i>Refrigerant</i>	Scope 1	0	0	0	0
COMMUNITY SERVICES		73.59	68.88	30.29	38.25
<i>Electricity</i>	Scope 2	63.67	60.50	27.00	34.34
<i>T&D losses</i>	Scope 3	4.82	5.19	2.32	3.12
<i>Transport - Diesel</i>	Scope 1	5.11	3.19	0.97	0.79
<i>Transport - Petrol</i>	Scope 1	0	0	0	0
<i>Refrigerant</i>	Scope 1	0	0	0	0
OPERATIONS		109.38	127.31	78.54	83.95
<i>Electricity - Other</i>	Scope 2	2.93	3.18	1.57	0.38
<i>Electricity - Streetlights</i>	Scope 2	62.52	49.70	20.38	21.24
<i>T&D losses</i>	Scope 3	4.96	4.35	1.88	1.96
<i>Transport - Diesel</i>	Scope 1	30.82	55.71	48.09	55.97

¹ Transport and Distribution

<i>Transport - Petrol</i>	Scope 1	8.16	14.19	6.62	4.39
WATER		1,205.72	1,273.71	1,226.35	1,234.82
<i>Water supply</i>	Scope 1	21.64	24.97	25.55	25.71
<i>Wastewater treatment</i>	Scope 1	1,092.83	1,117.08	1,134.95	1,140.91
<i>Electricity - WWTP</i>	Scope 2	45.11	84.21	23.51	28.52
<i>T&D losses</i>	Scope 3	3.42	7.22	2.02	2.59
<i>Transport - Diesel</i>	Scope 1	42.72	40.23	40.33	37.09
<i>Transport - Petrol</i>	Scope 1	0	0	0	0
PARKS AND RESERVES		49.79	29.11	23.60	25.15
<i>Electricity</i>	Scope 2	5.03	0.86	0.88	1.33
<i>T&D losses</i>	Scope 3	0.38	0.07	0.08	0.12
<i>Transport - Diesel</i>	Scope 1	42.09	25.42	21.00	22.43
<i>Transport - Petrol</i>	Scope 1	0.74	0.77	0.78	0.41
<i>Green waste – Landfill Uncertainty: +/- 40%</i>	Scope 3	1.55	1.99	0	0
<i>Green waste – Composted Uncertainty: +/- 40%</i>	Scope 3	0	0	0.86	0.86
REGULATORY		12.00	10.35	11.04	12.27
<i>Transport - Diesel</i>	Scope 1	6.52	5.93	2.63	2.91
<i>Transport - Petrol</i>	Scope 1	5.48	4.42	8.40	9.36
GROSS EMISSIONS		1,426.27	1,521.78	1,382.82	1,407.29

Table 1: Emissions by business units

	t Co₂e - 2018	t Co₂e - 2019	t Co₂e - 2020	t Co₂e - 2021
Scope 1	1,263.60	1,299.79	1,297.39	1,307.56
Scope 2	182.24	201.37	76.41	88.97
Scope 3	16.43	20.62	9.02	10.76
GROSS EMISSIONS	1,426.27	1,521.78	1,382.82	1,407.29

Table 2: Emissions by scopes

	t Co ₂ e - 2018	t Co ₂ e - 2019	t Co ₂ e - 2020	t Co ₂ e - 2021
ELECTRICITY	196.04	218.64	82.97	97.05
<i>Streetlights</i>	64.89	49.70	20.38	21.24
<i>Wastewater</i>	46.82	84.21	23.51	28.52
<i>Other</i>	77.44	67.46	32.53	39.20
<i>T&D losses</i>	16.22	17.27	6.55	8.08
TRANSPORT	149.72	158.49	137.71	141.81
<i>Petrol</i>	21.87	27.27	23.86	21.75
<i>Diesel</i>	127.25	130.47	113.02	119.19
<i>Flights</i>	0.60	0.75	0.83	0.87
WASTEWATER	1,092.83	1,117.08	1,134.95	1,140.91
WATER SUPPLY	21.64	24,97	25.55	25.71
WASTE	2.03	2.60	1.64	1.81
REFRIGERANT	0.00	0.00	0.00	0.00
GROSS EMISSIONS	1,426.27	1,521.78	1,382.82	1,407.29

Table 3: Emissions by sources

	t Co ₂ e - 2018	t Co ₂ e - 2019	t Co ₂ e - 2020	t Co ₂ e - 2021
GROSS EMISSIONS	1,426.27	1,521.78	1,382.82	1,407.29
<i>Forestry (removals)</i>	-7,249.14	-7,237.39	-7,237.39	-8,039.83
<i>Forestry (harvest emissions)</i>	0.00	0.00	0.00	0.00
TOTAL	-7,249.14	-7,237.39	-7,237.39	-8,039.83
NET EMISSIONS	-5,786.88	-5,715.61	-5,854.57	-6,632.54

Table 4: Forestry

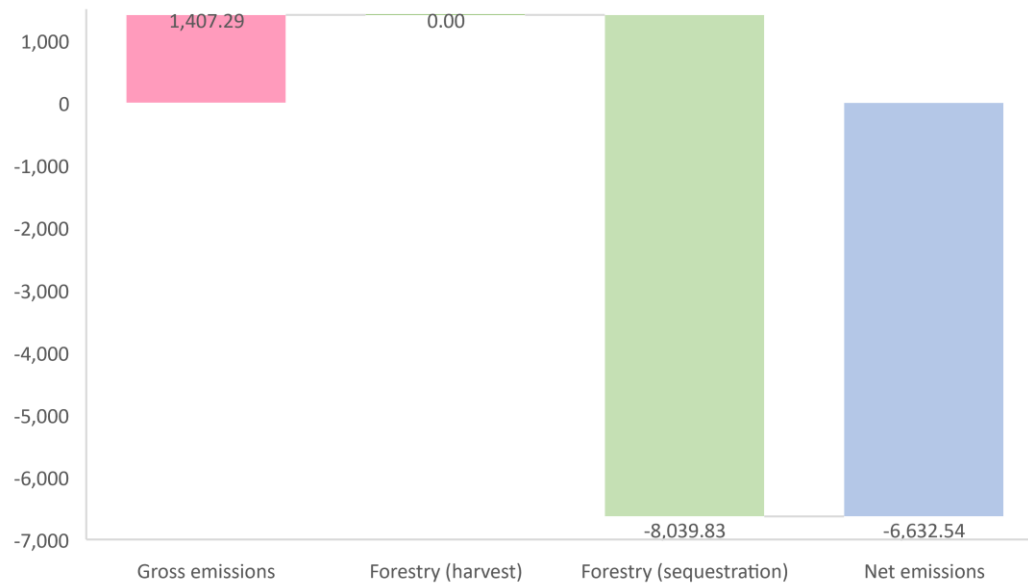


Figure 1: Gross versus Net emissions including forestry (tCO₂e)

	2018	2019	2020	2021
Gross emissions per FTE (t CO₂e) 2018: 59.8 FTE 2019: 61.2 FTE 2020: 66.3 FTE 2021: 65.6 FTE	24.45	24.87	20.36	21.45
Gross emissions per capita (kg CO₂e) 2018: 9,440 2019: 9,690 2020: 9,888 2021: 9,987	154.90	157.05	139.85	140.91

Table 5: Emissions per FTE and per head of population

2 Introduction

This report is the annual greenhouse gas (GHG) emissions² inventory report for Carterton District Council. The inventory is a complete and accurate quantification of the amount of GHG emissions that can be directly attributed to the organisation's operations within the declared boundary and scope for the specified reporting period.

The inventory has been prepared in accordance with the requirements of the *Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard (2004)* and *ISO 14064-1:2006 Specification with Guidance at the Organization Level for Quantification and Reporting of Greenhouse Gas Emissions and Removals*³.

3 Organisation Description

Carterton District Council (CDC) is the territorial authority for the Carterton District. CDC is located in the heart of the Wairarapa. The 30th of June 2021, CDC employed 65.6 FTEs (Full Time-Equivalent) and is responsible for water and wastewater, waste, local roads (excluding State Highway), streetlighting, parks and reserves, community facilities and performing statutory duties such as regulatory compliance.

The council is organised as shown below:

- Corporate services,
- Community services,
- Operations,
- Water,
- Parks and reserves,
- Regulatory.

² Throughout this document 'emissions' means GHG emissions.

³ Throughout this document 'GHG Protocol' means the GHG Protocol Corporate Accounting and Reporting Standard and 'ISO 14064- 1:2006' means the international standard Specification with Guidance at the Organizational Level for Quantification and Reporting of Greenhouse Gas Emissions and Removals.

4 Inventory boundaries

This inventory covers a period from January 2021 to December 2021.

4.1 Organisational boundaries

4.1.1 Organisational boundaries included for this reporting period

Organisational boundaries were set with reference to the methodology described in the GHG Protocol and ISO 14064-1:2006 standards. The GHG Protocol allows two distinct approaches to consolidate GHG emissions: the equity share and control (financial or operational) approaches. We used an operational control approach to account for emissions.

This GHG inventory includes all the council’s business units as shown in Figure 2: Organisational structure below.

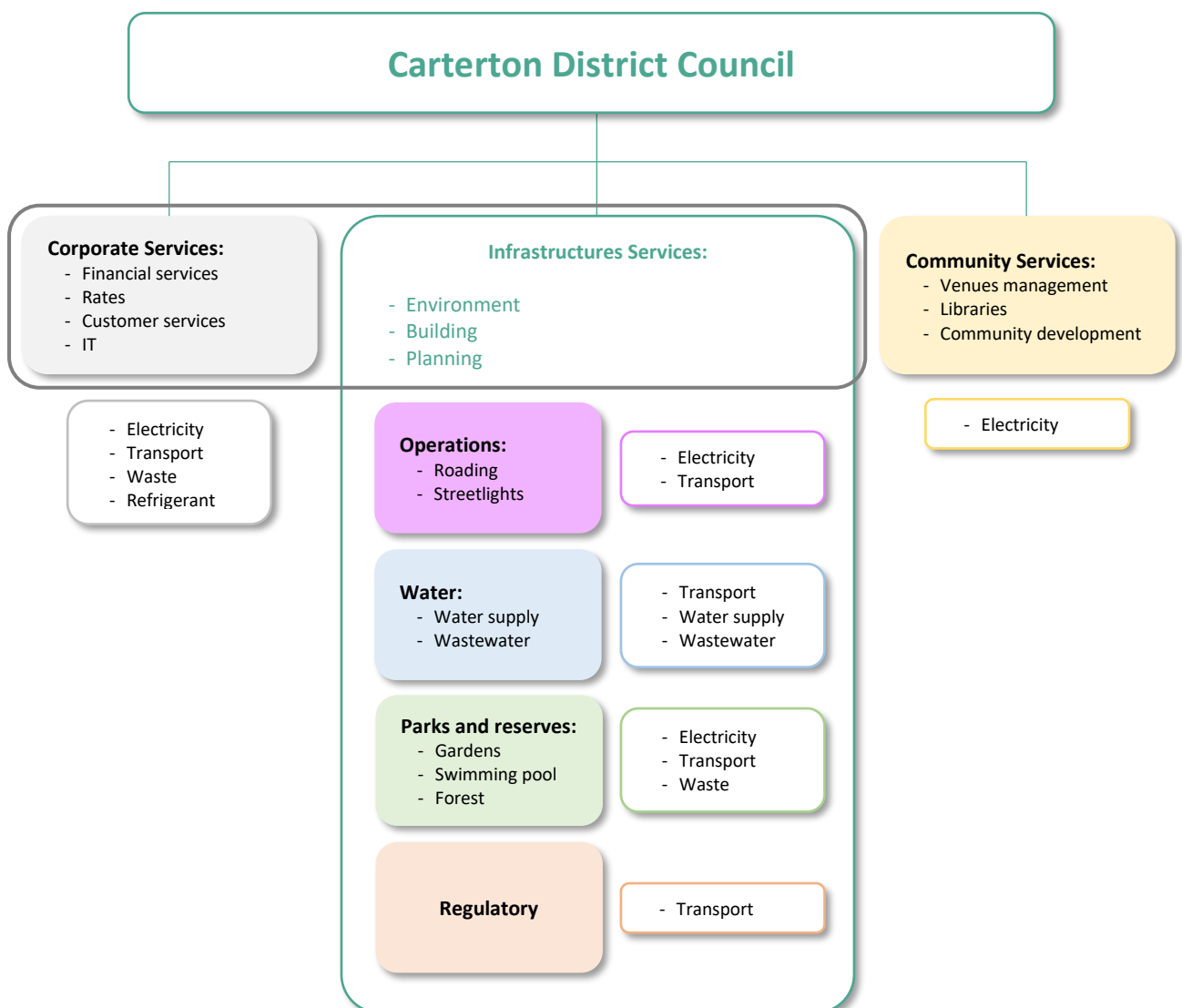


Figure 2: Organisational structure and emission sources

Environment, Building and Planning from Infrastructure services share the same building as Corporate services. Therefore, they have been aggregated under the same business unit “Corporate services”.

4.1.2 Organisational business units excluded from inventory

Business unit	GHG emission source	Scope	Reason for exclusion
Community services - Properties	Electricity	Scope 2	Tenants pay their own power accounts
Operations - Waste management	Waste from the community	Scope 3	Outside of CDC operational control Contractor: Earth Care
Operations - Roading	Emissions from road maintenance	Scope 3	Outside of CDC operational control Contractor: Fulton Hogan

Table 6: Business units and GHG emission source excluded from this inventory

4.2 Reporting boundaries

4.2.1 GHG emission sources inclusions

The GHG emissions sources included in this inventory were identified with reference to the methodology in the *GHG Protocol and ISO14064-1:2006 standards*. As adapted from the *GHG Protocol*, these emissions were classified under the following categories:

- **Direct GHG emissions (Scope 1):** emissions from sources that are owned or controlled by the company (emissions from vehicles, refrigerant leaks)
- **Electricity indirect GHG emissions (Scope 2):** emissions from the generation of purchased electricity consumed by the company.
- **Other indirect GHG emissions (Scope 3):** emissions that occur as a consequence of the company's activities but from sources not owned or controlled by the company (waste, energy transport and distribution losses, ...).

This inventory considers:

- Corporate services:
 - Electricity
 - Transport and distribution losses
 - Transport – Diesel
 - Transport – Petrol
 - Transport – Flights
 - Waste
 - Refrigerant
- Community services:
 - Electricity
 - Transport and distribution losses
 - Transport – Diesel
 - Transport – Petrol
 - Refrigerant
- Operations:
 - Electricity – Other
 - Electricity – Streetlights
 - Transport and distribution losses
 - Transport – Diesel
 - Transport – Petrol

- Water:
 - Water supply
 - Wastewater treatment
 - Electricity – WWTP
 - Transport and distribution losses
 - Transport – Diesel
 - Transport – Petrol
- Parks and reserves:
 - Electricity
 - Transport and distribution losses
 - Transport – Diesel
 - Transport – Petrol
 - Green waste
- Regulatory:
 - Transport – Diesel
 - Transport – Petrol

4.2.2 GHG emission source exclusions

For more information, refer to Table 6: Business units and GHG emission source excluded from this inventory.

5 Data collection and uncertainties

Table 7 gives an overview of how data were collected for each GHG emissions source, the source of the data and an explanation of any uncertainties or assumptions.

A calculation methodology has been used for quantifying the emissions inventory using emissions source activity data multiplied by emission or removal factors. All emission factors (and uncertainties) were sourced from the Ministry for the Environment’s *2020 Measuring Emissions: A Guide for Organisations*.

Business Unit	GHG emission source	Scope	Data source	Data collection unit	Uncertainty (description)
Corporate services	Electricity	Scope 2	Electricity company	kWh	Low It is assumed that the meter readings were done correctly
	Transport and distribution losses	Scope 3			
	Transport - Diesel	Scope 1	Fuel company	L	Low It is assumed that the supplier reports are complete and accurate
	Transport - Petrol	Scope 1			
	Transport - Flights	Scope 3	Finance team	Km	Low/Moderate It is assumed that the employees’ reports are complete and accurate
	Waste	Scope 3	Council officer	Kg	Moderate Estimation made by the staff in charge of the waste collection
	Refrigerant	Scope 1	A/C company	Kg	Low It is assumed that the supplier data is complete and accurate
	Electricity	Scope 2		kWh	Low

Business Unit	GHG emission source	Scope	Data source	Data collection unit	Uncertainty (description)
Community services	Transport and distribution losses	Scope 3	Electricity company		It is assumed that the meter readings were done correctly
	Transport - Diesel	Scope 1	Fuel company	L	Low
	Transport - Petrol	Scope 1			It is assumed that the supplier reports are complete and accurate
	Refrigerant	Scope 1	A/C company	Kg	Low It is assumed that the supplier data is complete and accurate
Operations	Electricity - other	Scope 2	Electricity company	kWh	Low It is assumed that the meter readings were done correctly
	Electricity - Streetlights	Scope 2			
	Transport and distribution losses	Scope 3			
	Transport - Diesel	Scope 1	Fuel company	L	Low
	Transport - Petrol	Scope 1			It is assumed that the supplier reports are complete and accurate
Water	Water supply	Scope 1	Council officer	m ³	Low It is assumed that the data source is an appropriate representation of activities
	Wastewater treatment	Scope 1	Council officer	DBO Nitrogen	Low It is assumed that the data source is an appropriate representation of activities
	Electricity - WWTP	Scope 2	Electricity company	kWh	Low It is assumed that the meter readings were done correctly
	Transport and distribution losses	Scope 3			
	Transport - Diesel	Scope 1	Fuel company	L	Low
	Transport - Petrol	Scope 1			It is assumed that the supplier reports are complete and accurate
Parks and reserves	Electricity	Scope 2	Electricity company	kWh	Low It is assumed that the meter readings were done correctly
	Transport and distribution losses	Scope 3			
	Transport - Diesel	Scope 1	Fuel company	L	Low It is assumed that the supplier reports are complete and accurate
	Transport - Petrol	Scope 1			
	Green waste	Scope 3	Council officer	Kg	Moderate Estimation made by the staff in charge of the green waste
Regulatory	Transport - Diesel	Scope 1	Fuel company	L	Low
	Transport - Petrol	Scope 1			It is assumed that the supplier reports are complete and accurate

Table 7: GHG emission sources, data collection and uncertainty

6 GHG emission calculations and results

6.1 Evolution of the GHG emissions

6.1.1 Base year

The first greenhouse gas inventory done for Carterton District Council was made in 2018 (January to December). It set up the baseline.

6.1.2 Evolution of the GHG emissions and significant emissions changes

Note #1: Emission factors (EF) released by MfE are used in the greenhouse gas inventory.

Note #2: The district was in lock down level 3 and 4 between the 23rd of March 2020 and 14th May 2020 and between the 17th of August 2021 and the 7th September 2021 due to Covid-19 pandemic.

The gross emissions decreased by over 4% between 2018 and 2020.

The emissions from the business units *Corporate Services*, *Water supply and WWT* and *Regulatory* respectively increased by 9%, 2% and 2%. The emissions from the business units *Community Services*, *Parks and Reserves* and *Operation* respectively decreased by 48%, 49% and 23%.

The scopes 2 and 3 decreased (51% and 35% respectively). Scope 1 increased by 3%.

The emissions from *Electricity*, *Transport* and *Waste* decreased (50%, 5% and 11% respectively) while the emissions coming from *Wastewater* and *Water Supply* increased (4% and 19% respectively).

Gross emissions by FTE and by Capita decreased respectively by 12% and 9%.

Carbon sequestration increased by 11%, therefore, net emissions increased by almost 15%. Because CDC is a carbon negative organisation due to its forest, having a net emissions increase is positive (we sequestered more carbon than the previous years).

	Evolution 2018 - 2021
Corporate Services	+8.99%
Community Services	-48.03%
Operations	-23.25%
Water supply and Wastewater treatment	+2.41%
Parks and Reserves	-49.48%
Regulatory	+2.22%
GROSS EMISSIONS	-3.76%

Table 8: Changes for the emissions by business units since 2018

	Evolution 2018 - 2021
Scope 1	+3.48%
Scope 2	-51.18%
Scope 3	-34.51%
GROSS EMISSIONS	-3.76%

Table 9: Changes for the emissions by scopes since 2018

	Evolution 2018 - 2021
Electricity	-50.49%
Transport	-5.29%
Wastewater	+4.40%
Water supply	+18.81%
Waste	-10.77%
Refrigerant	0.00%
GROSS EMISSIONS	-3.76%

Table 10: Changes for the emissions by sources since 2018

	Evolution 2018 - 2021
Gross emissions per FTE	-12.27%
Gross emissions per capita	-9.03%

Table 11: Changes for the emissions per FTE and per capita since 2018

	Evolution 2018 - 2021
GROSS EMISSIONS	-3.76%
Sequestration (forest)	+10.91%
Harvest emissions	0%
NET EMISSIONS	+14.61%

Table 12: Changes for the net emissions since 2018

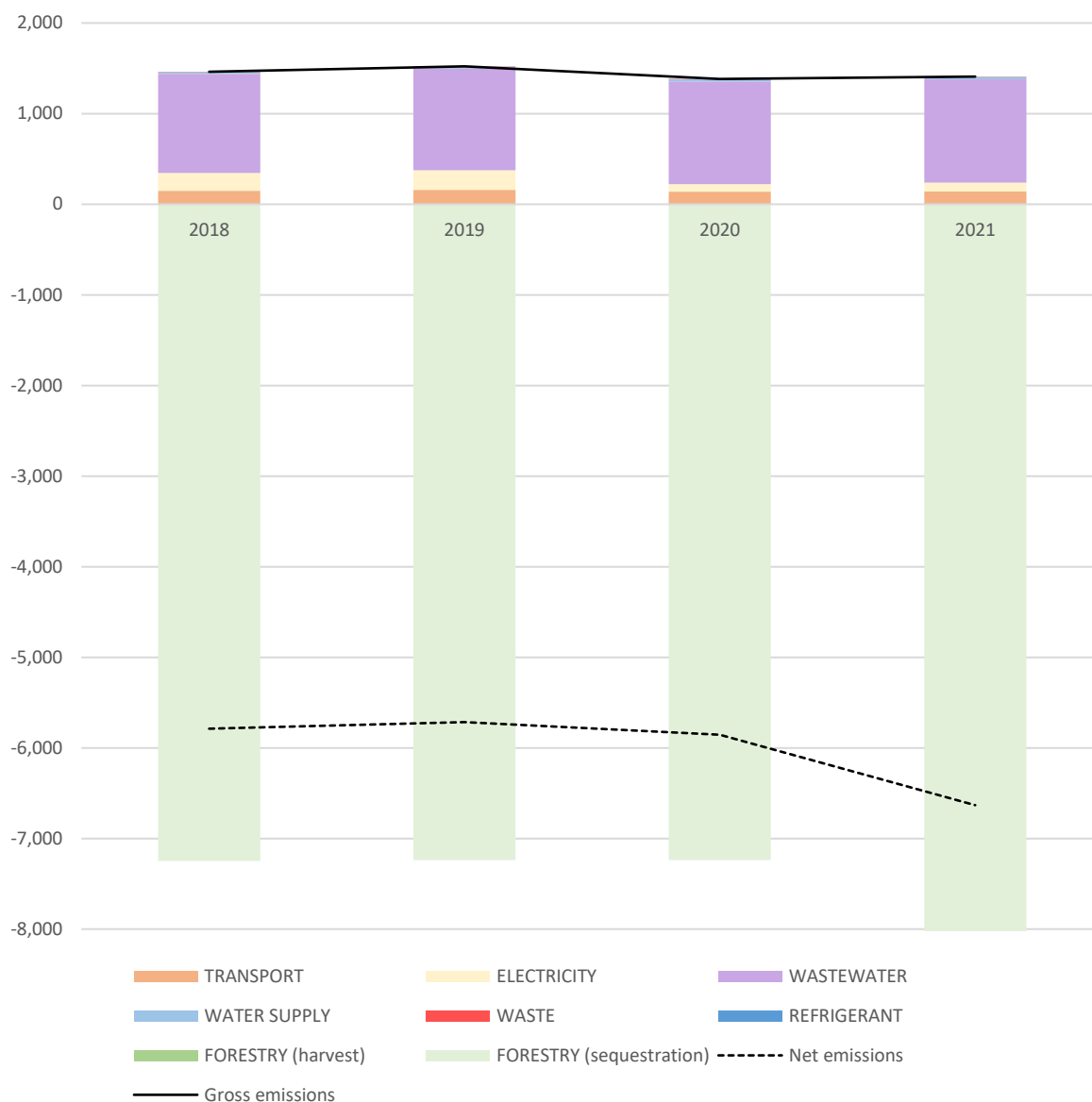


Figure 3: Annual emissions showing gross and net emissions (including forestry) since 2018

6.1.3 Evolution of the biogenic methane emissions

	2018	2019	2020	2021	Evolution 2018 - 2021
Waste	0.48	0.61	0.78	0.95	+99.76%
Green waste	1.55	1.99	0.50	0.50	-67.76%
Wastewater	847.30	866.26	880.25	884.91	+4.44%
Total	849.32	868.87	881.53	886.36	+4.36%

Table 13: Biogenic methane emissions (tCH₄)

Biogenic methane from green waste was reduced due to the fact that the green waste is now being composted.

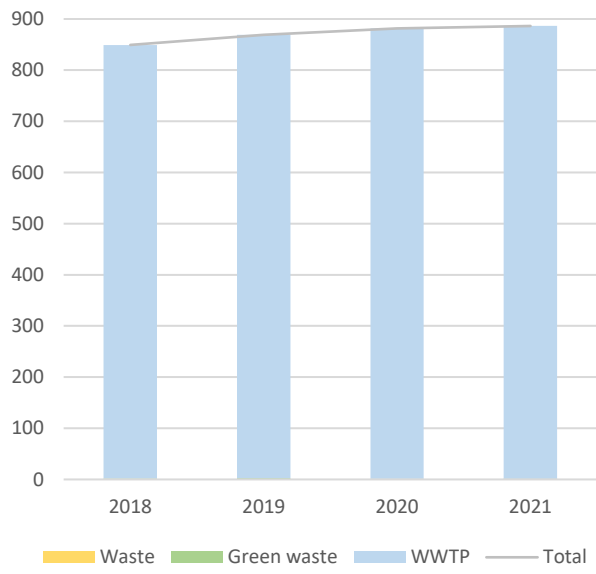


Figure 4: Biogenic methane emissions since 2018

6.2 Emissions for all seven GHGs

The seven GHG included in this inventory are:

- Carbon dioxide: CO₂
- Methane: CH₄
- Nitrous oxide: N₂O
- Hydrofluorocarbons: HFCs
- Perfluorocarbons: PFCs
- Sulfur hexafluoride: SF₆
- Nitrogen trifluoride: NF₃

	2018	2019	2020	2021
t CO₂ e	1,462.27	1,521.78	1,382.82	1,407.29
t CO₂	354.29	388.88	238.80	258.26
t CH₄	859.52	878.83	886.27	890.24
t N₂O	248.46	254.08	257.76	259.16
t HFCs	0	0	0	0
t PFCs	0	0	0	0
t SF₆	0	0	0	0
t NF₃	0	0	0	0

Table 14: Emissions for all seven GHGs

6.3 Gross emissions by scope, business unit and source

GHG emissions for Carterton District Council for 2021 are provided in the GHG Inventory summary section at the start of this report.

The following figures give an overview of where the gross emissions are occurring across the organisation.

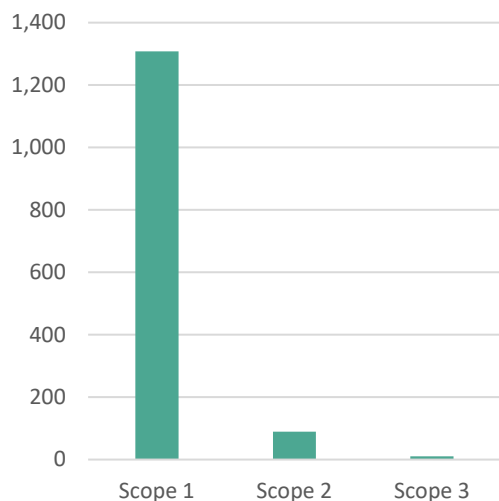


Figure 5: Gross emissions by scope (tCO₂e)

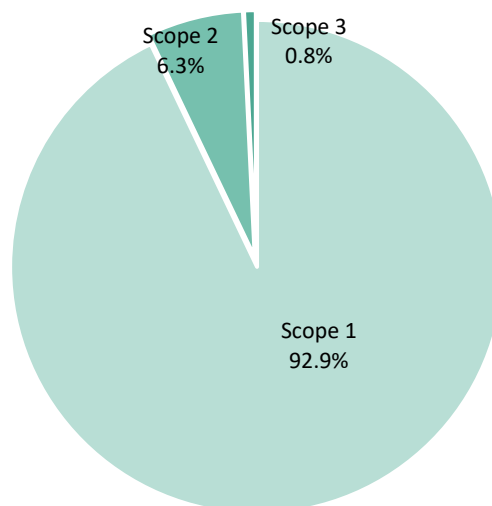


Figure 6: Gross emissions by scope (%)

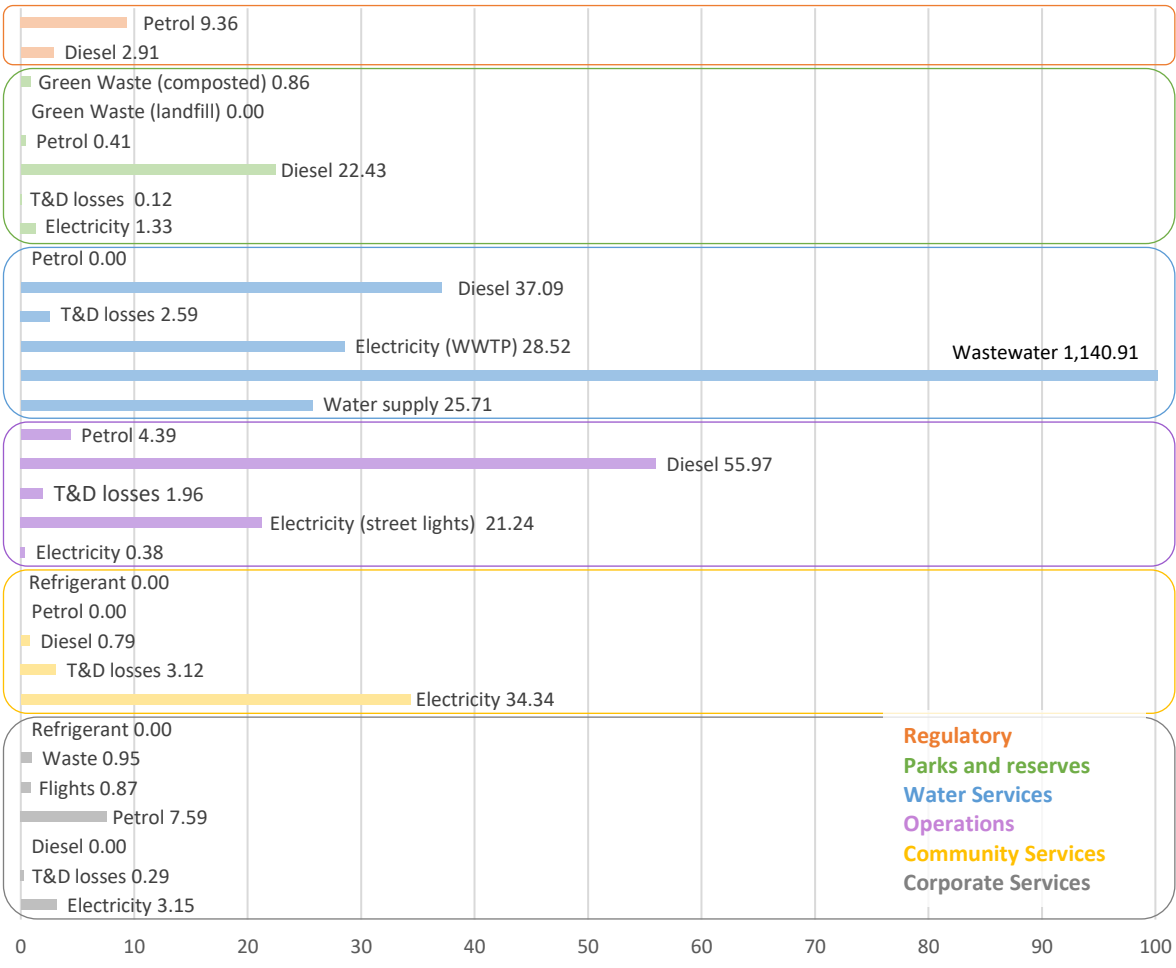


Figure 7: Gross emissions by business unit (tCO₂e)

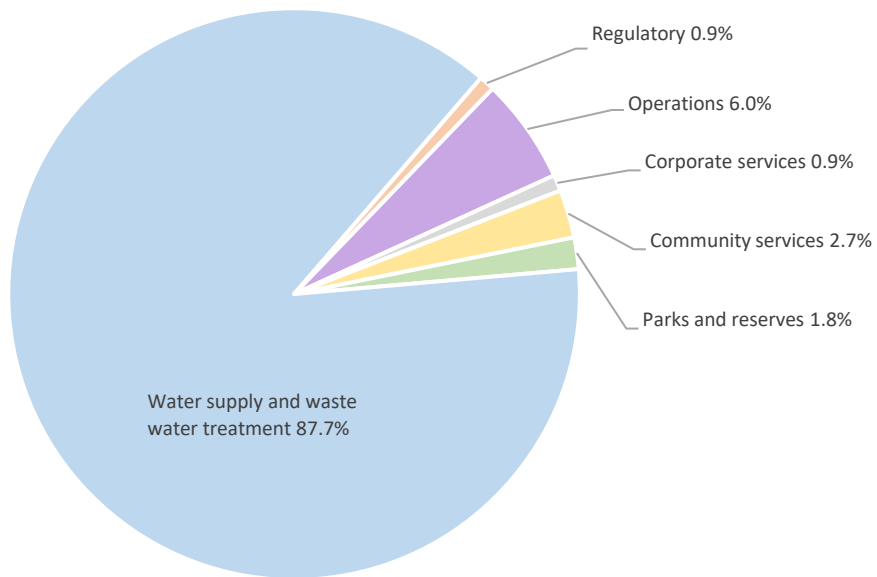


Figure 8: Gross emissions by business unit (%)

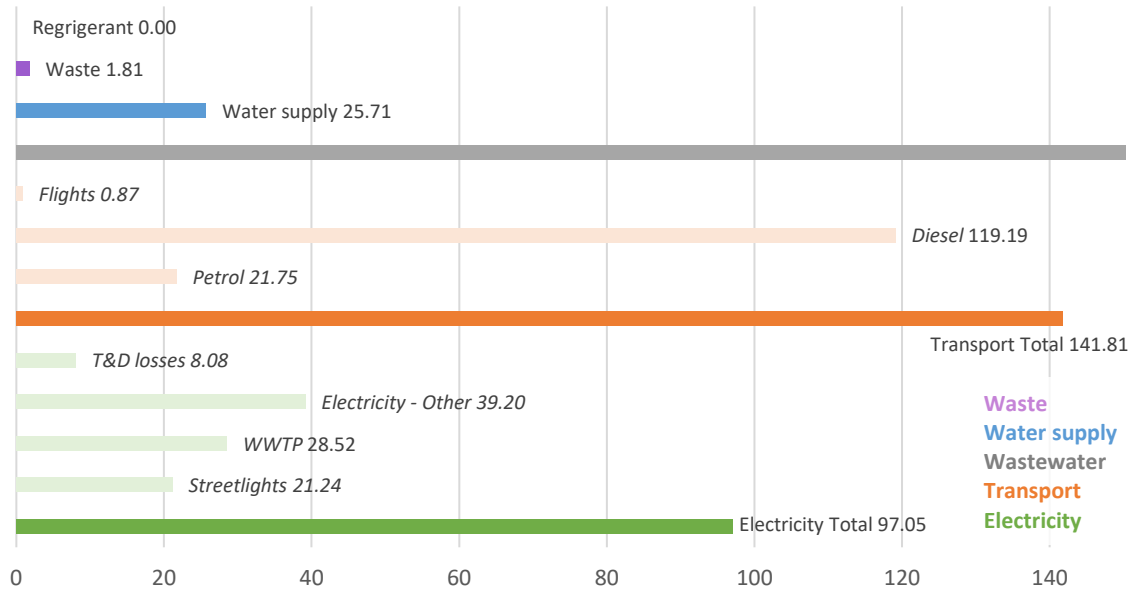


Figure 9: Gross emissions by source (tCO₂e)

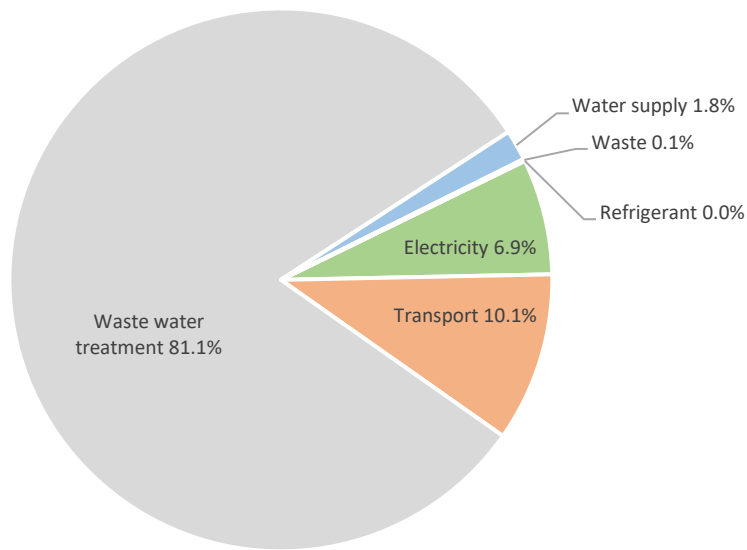


Figure 10: Gross emissions by source (%)

6.4 Emissions from biologically sequestered carbon

Carterton District Council owns a 350-ha forest in the Tararua Range which contains a net stocked area of 262.7 ha. The forest is classified as pre-1990 forest land, and consists mainly of Radiata Pine, with smaller areas of Manuka and cypress:

- Planted forest:
 - Radiata Pine – growth: 212.2 ha
 - Radiata Pine – old: 22.9 ha
 - Cypress – growth: 1.6 ha
- Natural forest:
 - Manuka – Regenerating: 26 ha

There was no harvesting in 2021.

		Units	t CO ₂ e	t CO ₂	t CH ₄	t N ₂ O
Carbon sequestration	Native forest	26 ha	-207.30	-207.30	n/a	n/a
	Planted forest	213.8 ha	-7,832.53	-7,832.53	n/a	n/a
Harvest emissions	Planted forest	0 ha	0	0	n/a	n/a
	Native forest	0 ha	0	0	n/a	n/a
TOTAL			-8,039.83	-8,039.83	n/a	n/a

Table 15: Total CO₂ sequestered and emitted by forestry in 2021

7 Liabilities

7.1 GHG stocks held

HFCs, PFCs and SF₆ represent GHGs with high global warming potentials. Their accidental release could result in a large increase in emissions for the reporting period. Therefore, any GHG stocks are included in the greenhouse gas emissions inventory to identify significant liabilities and implement procedures for minimising the risk of their accidental release.

HFCs, PFCs and SF₆ represent GHGs with high global warming potentials. Their accidental release could result in a large increase in emissions for that year, and therefore the stock holdings are reported in this inventory (Table 16: HFCs, PFCs and SF₆ held by CDC).

Source	Amount held – January 2021	Amount held – December 2021	Potential liability
R410-A	39.1 kg	39.1 kg	81.6 tCO ₂ e
R32	1.27 kg	1.27 kg	0.9 tCO ₂ e
TOTAL			82.5 tCO₂e

Table 16: HFCs, PFCs and SF₆ held by CDC

7.2 Land-use change

Organisations that own land subject to land-use change may achieve sequestration of carbon dioxide through a change in the carbon stock on that land. If a sequestration is claimed, this also represents a liability in future years should fire, flood or other management activities release the stored carbon.

Land-use change has been included in this inventory. CDC owns a 213.8 ha of growing planted forest (mainly Radiata pine), 22.9 ha of old planted forest (Radiata pine) and 26 ha of natural forest (Manuka). The potential liability of the land-use change is 247,075.02 tCO₂e.

	t CO ₂ e	t CO ₂	t CH ₄	t N ₂ O
Carbon emission (deforestation) – Planted forest	243,399.92	243,399.92	n/a	n/a
Carbon emission (deforestation) – Native forest	3,675.10	3,675.10	n/a	n/a
TOTAL	247,075.02	247,075.02	n/a	n/a

Table 17: Potential liability of the land-use change

8 Methodology and references

8.1 Methodology

The greenhouse gas inventory method used by Carterton District Council is based on the following guides:

- National guidance:
 - o Measuring Emissions: A guide for Organisations – MfE (2019, 2020, 2022)
 - o Carbon accounting guidelines for wastewater treatment: CH₄ and N₂O – Water New Zealand
- International guidance:
 - o The Greenhouse Gas Protocol
 - o ISO14064-1:2018

More information [here](#) (MfE guidance) and [here](#).(Water NZ guidance).

8.2 References

Measuring Emissions: A guide for Organisations – MfE, 2019, 2020, 2022

Carbon accounting guidelines for wastewater treatment: CH₄ and N₂O – Water New Zealand

The Greenhouse Gas Protocol: A corporate accounting and reporting standard – World Business Council for Sustainable Development and World resources Institute, 2004 (revised)

ISO14064-1:2018. Greenhouse gases – Part 1: Specification with guidance at the organisation level for quantification and reporting of greenhouse gas emissions and removals – International Organization for Standardization, 2018 (revised)

Disclaimer:

The information in this greenhouse gas inventory is true and complete to the best of our knowledge. The calculation method used (MfE workbook and MfE factors), the inclusions and exclusions of this inventory may be different from other inventories and can explain the differences. The author and publisher disclaim any liability in connection with the use of this information.