Te Kaunihera ō Taranaki ki Te Tonga
South Taranaki District Council

Pūrongo
Report

South Taranaki District Council Greenhouse Gas Emissions Inventory Technical Report

1 July 2019 to 30 June 2020

Document Details

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Report Dated:	August 2021
Version:	1.0
Verification status:	In scope emissions data externally reviewed and certified by EKOS Ltd.
Emissions for the period:	01/07/2019 to 30/06/2020

Technical Notes

This report was produced according to the New Zealand Ministry for the Environment (MFE) detailed guide on best practice for organisational emissions reporting.[1]

All emission factors in this report are expressed in units of carbon dioxide equivalent (CO_2-e), which is in line with best-practice and based on the following publications, protocols and standards:

- Measuring Emissions: A Guide for Organisations (MFE, 2020),[1]
- The GHG Protocol: A Corporate Accounting and Reporting Standard, Revised Edition (World Business Council for Sustainable Development and World Resources institute, 2004)[2] and,
- International Organization for Standardization (ISO) Standard 14064-1:2018 (ISO, 2018).[3]

The Global Warming Potentials (GWPs) used in this report are taken from the MFE "Measuring Emissions: A Guide for Organisations" document and are in line with the reporting standards for the United Nations Framework Convention on Climate Change (UNFCCC) and the Paris Agreement (UNFCCC, 2015),[4] to which the New Zealand National Greenhouse Gas Inventory Report is submitted (MFE, 2021).[5]

[1] MFE, 2020. Measuring emissions: A guide for organisations. Detailed Guide 2020.
[2] World Business Council for Sustainable Development and World Resources Institute, 2004. A Corporate Accounting and Reporting Standard: Revised Edition
[3] ISO, 2018. Standard 14064-1:2018
[4] UNFCCC, 2015. Paris Agreement
[5] MFE, 2021. New Zealand's Greenhouse Gas Inventory

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Executive Summary

Te Rautaki Toitū Te Taiao – South Taranaki District Council's (STDC's) Environment and Sustainability Strategy sets the goal of becoming a net carbon zero organisation by 2035. To reach this goal, South Taranaki District Council (STDC) must first understand, track, and report on its organisational emissions profile, and then take action to reduce those emissions wherever possible.

This report presents the findings of STDC's third emissions inventory, covering the 2019/20 financial year. The results of this inventory have been externally reviewed and certified by EKOS Ltd, an organisation that routinely assesses carbon inventories for accuracy and compliance with internationally standardised reporting frameworks. This is the first time that STDC's annual emissions inventory has been externally checked and certified, and is an important step forward for our organisation's sustainability maturity.

STDC's net organisational emissions for 2019/20 were 1,216 tonnes CO_2-e. Of the 1,216 tonnes CO_2-e STDC emitted in 2019/20, 33% came from natural gas, 37% came from purchased electricity, and 13% came from vehicle usage. The remaining emissions came from transmission/distribution losses and fuel production related emissions (13%), business waste (2%), business travel (1%), backup generators (.4%), outdoor machinery (.2%), purchased goods and services – paper (.3%) and upstream freight (.08%).

The goal set forth in STDC's Te Rautaki Toitū Te Taiao – Environment and Sustainability Strategy to reach net carbon zero status by 2035 is ambitious. To reach this goal, STDC will have to reduce its emissions footprint by an average of 89.29 tonnes per year each year until 2035. This report outlines the key tools that will support reaching this goal, which include:

- completing prioritised energy audits of our largest-emitting facilities (getting underway in September 2021 for our top three emitting facilities);
- using the results of the energy audits above to transition those facilities to renewable or more efficient energy systems;
- transitioning STDC's fleet to hybrid and/or electric vehicles as much as possible; and
- offsetting emissions we can't reduce with native reforestation of Council-owned land.

Background and Purpose

A key goal of the South Taranaki District Council (STDC) Te Rautaki Toitū Te Taiao – Environment and Sustainability Strategy is for STDC to be a net carbon zero organisation by 2035. Regionally, South Taranaki District Council is also committed to the "just transition towards low emissions" described in the Taranaki 2050 Roadmap (Venture Taranaki, 2019)[6].

To reach net zero emissions by 2035, STDC must first understand, track, monitor and report on the annual organisational emissions produced as a result of Council's day-to-day operations (STDC's organisational emissions profile), and then take action to reduce those emissions wherever possible.

[6] Venture Taranaki, 2019. Taranaki 2050 Roadmap

Emissions inventories are essential for understanding and minimising organisational greenhouse gas emissions. Emissions inventories are a quantification of the amount of GHG emissions that can be directly linked to STDC's operational activities.

The principal aims of this emissions inventory report are to:

- Provide a detailed account of STDC's emissions profile for the 2019/20 financial year;
- Note change over time by comparing the 2019/20 emissions profile to the 2017/18 and 2018/19 financial years;
- Enable informed decision making and policy development for reducing STDC's emissions across the business to move towards lower emissions and more environmentally sustainable modes of operation; and
- Identify key business units, activities or facilities with relatively high emissions, so that those areas can be targeted first for implementation of emissions reduction strategies.

Further linked work is also underway within Council to:

- Embed environmental sustainability and emissions reduction criteria in all decision-making and regulatory tools across the business;
- Understand and map climate change risk and vulnerability profiles for the District and Region; and
- Work collaboratively and in partnerships with Iwi, central and local government agencies, key businesses, local research organisations, and our communities to enable a just transition to a low emissions future.

STDC's 2017/18 greenhouse gas emissions inventory was the first comprehensive attempt at baselining Council's organisational emissions, which formed the basis for an annual programme of monitoring and reducing emissions year-on-year.

This report represents the findings of STDC's third emissions inventory, covering organisational emissions from the 2019/20 financial year.

The results of this inventory have been externally reviewed and certified by EKOS Ltd (see Appendix 6 and Appendix 7). EKOS Ltd is an organisation that routinely assesses carbon inventories for accuracy and compliance with internationally standardised reporting frameworks.

This is the first time that STDC's annual emissions inventory has been externally verified and certified, and is an important step forward for our organisation's sustainability maturity.

As this is STDC's first externally reviewed emissions profile, this 2019/20 inventory will become the new baseline year for future inventories.

It is important to note that STDCs Scope 1 and 2 emissions are well understood, and additional new Scope 3 emission sources have been included in STDC's 2019/20 inventory, STDC's full Scope 3 emissions profile is still incomplete. Due to the wide-ranging complexity of Scope 3 emissions sources, and the associated tracking of data to verify these, it takes an average of five years to track down and fully account for an organisations' emissions from every source within Scope 3.

Notable emission sources that will need to be added in future Scope 3 profiles include: emissions from wastewater treatment plant ponds, construction and demolition projects (eg. Te Ramanui), investment related emissions from the Long-Term Investment Fund and other investments, employee commuter emissions, purchased goods and services (beyond paper, and including all purchased goods, services and contracts), and forestry harvest and sequestration, among other sources not yet accurately accounted for.

Key Emissions Results for 2019/2020

Overall Profile

For 2019/20, STDC's net organisational emissions were 1,216 tonnes CO_2-e (see Table 1). Of these emissions, 83% were either Scope 1 (direct fuel use + refrigerant emissions) or Scope 2 (electricity use) emissions.

STDC's Scope 1 and 2 emissions have been relatively static over time, with a less than ± 10% fluctuation across all three reporting years. Figure 1 compares STDC's Scope 1 and 2 emissions over the three years that STDC has been conducting emissions profiles.

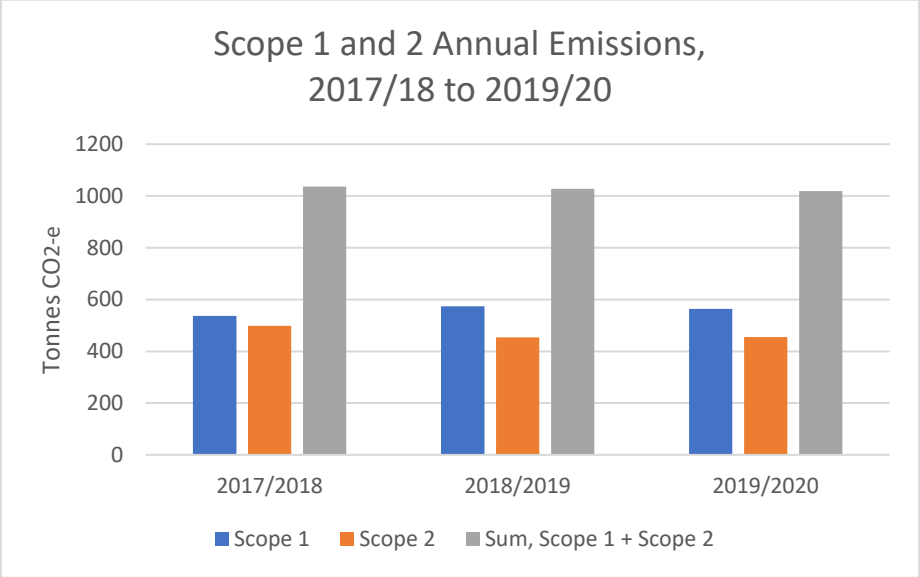


Figure 1: STDC's Scope 1 and Scope 2 emissions across all three reporting years

Scope 1 and 2 emissions are where STDCs biggest proportional emissions sources are generated, and these areas will be key to successful emissions reduction.

In 2019/20, STDC included Scope 3 emissions for the first time (Scope 3 data was not available in previous years). Scope 3 emissions are indirect GHG emissions occurring because of activities of the organisation but generated from sources that it does not own or control. New Scope 3 additions to the 2019/20 emissions profile include: business travel, transmission and distribution losses + fuel production related emissions (fuel and energy related emissions), purchased goods and services – paper, inward freight, and organisational waste (see Table 1).

When Scope 3 emissions are included, STDC's organisational emissions were approximately 189 tonnes CO_2-e higher in the 2019/20 financial year (1,216 tonnes CO_2-e), compared to the 2017/18 baseline year (1,036 tonnes CO_2-e). This equates to an 18.4% increase in emissions year-on-year, caused by the new inclusion of select Scope 3 emissions.

Table 1: Breakdown of STDC organisational emissions by source in 2017/18 (baseline year), 2018/19, and 2019/20.

Emissions source		2017/2018		2018/2019		2019/2020	
		Tonnes CO_2-e	% total	Tonnes CO_2-e	% total	Tonnes CO_2-e	% total
Scope 1	Fuel	532.52	51.4%	568.66	55.4%	560.34	46.06%
	Refrigerant use	4.82	<1%	4.99	<1%	4.18	<1%
Scope 2	Electricity	498.59	48.1%	453.66	44.2%	454.56	37.36%
Scope 3 (all new measures)	Purchased goods and services - paper	--	--	--	--	3.39	<1%
	Fuel and energy related emissions	--	--	--	--	156.91	12.90%
	Upstream freight	--	--	--	--	.9225	<1%
	Business waste	--	--	--	--	23.37	1.92%
	Business travel	--	--	--	--	12.91	1.06%
	Total GHG Inventory	**1,036**		**1,027**		**1,216**	

Emissions by activity use type

It is useful to break the Scope 1 fuel emissions down further by activity use type. Within fuel emissions, activity use types include natural gas, vehicles – petrol, vehicles – diesel, backup generators, and outdoor machinery. Other activity use types include: refrigerants, electricity, purchased goods and services – paper, fuel and energy related emissions, upstream freight, business waste, and business travel.

The graph below (Figure 2) displays a breakdown of organisational GHG emissions by activity type. Please note that emissions sources that make up less than 1% of STDC's emissions profile have been excluded from this graph for ease of viewing. These minor emission sources excluded from the graph include: backup generators, outdoor machinery, purchased goods and services – paper, and upstream freight.

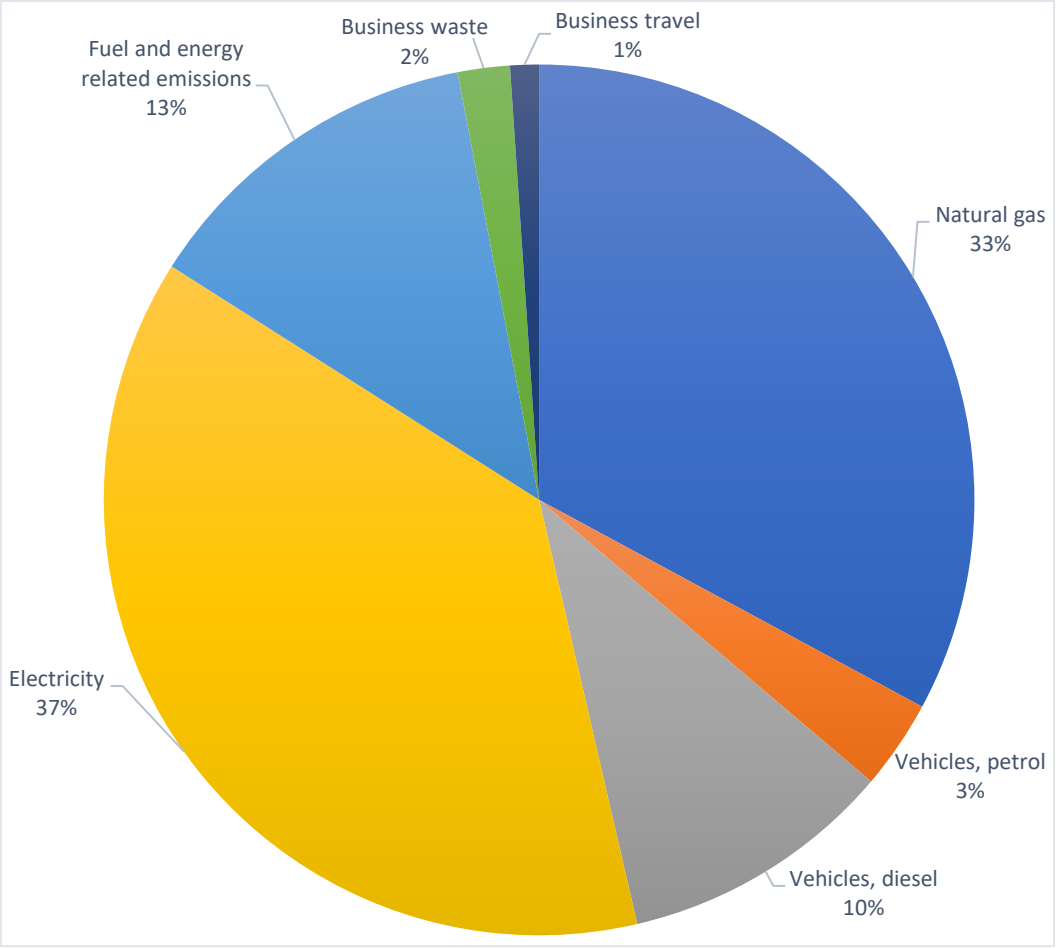


Figure 2. Organisational emissions proportions by activity use types

Natural gas emissions

As Figure 2 shows, natural gas alone makes up 33% of STDC's organisational emissions profile. There are only four STDC facilities that use natural gas (see Table 2).

Table 2: Natural gas emissions in the 2019/20 financial year

Rank	Building Name/Type	Natural gas usage, %
1	Aquatic Centre – Hāwera	96.22%
2	TSB Hub – Hāwera	2.78%
3	Community Centre – Hāwera	0.96%
4	Park - Ōpunakē, Egmont Plains Park	0.04%

Of these facilities, the Hāwera Aquatic Centre uses over 96% of all STDC's natural gas. Since natural gas makes up 33% of STDC's organisational emissions profile, the natural gas used at the Hāwera Aquatic Centre is responsible for just over 31% of STDC's current overall GHG emissions footprint. Addressing this one large source of STDC's emissions will be a key means of reaching organisational emissions reduction targets, as it would reduce our organisational emissions footprint by more than 30%.

Electricity emissions

Another major source for emissions for STDC is electricity (37%, see Figure 2). To better understand STDC's electricity usage, it is useful to identify the top electricity consuming STDC facilities. Table 3 displays the top 10 STDC facility consumers of electricity during the 2019/20 financial year.

Table 3: Council facilities with the highest electricity consumption over the 2019/20 financial year

Rank	Building Name/Type	2019-20 Electricity usage, kg CO_2-e	% of total electricity emissions
1	Wastewater Treatment Plant – Hāwera	73,006	14.50%
2	Aquatic Centre - Hāwera	51,779	10.29%
3	Wastewater Treatment Plant - Eltham	51,494	10.23%
4	TSB Hub - Hāwera	34,278	6.81%
5	Water Treatment Plant - Kapuni	32,370	6.43%
6	Streetlights - Hāwera	30,191	6.00%
7	Admin Building - Hāwera	19,724	3.92%
8	Intake - Kapuni	14,475	2.88%
9	Cinema 2 Ltd	13,383	2.66%
10	Streetlights - Waverley	10,868	2.16%

Two of the top consumers of electricity are the Wastewater Treatment Plan (WWTP) – Hāwera and the WWTP – Eltham. Together, the Hāwera and Eltham WWTPs account for nearly 25% of STDC's electricity footprint. Since electricity accounts for 37% of STDC's overall emissions, these two WWTP facilities together account for 9.2% of STDC's overall GHG emissions footprint.

The Hāwera Aquatic Centre is another notable consumer of electricity (in addition to the Hāwera Aquatic Centre's natural gas usage), as are the TSB Hub, Kapuni WWTP, and Streetlights.

The top three energy using facilities in Table 3 above will undergo an energy audit by an external consultant in the 2021/22 financial year, co-funded by EECA. The results of this energy audit will be used to transition these facilities to more energy efficient, low emissions and/or renewable energy sources wherever possible.

Vehicle emissions

Beyond stationary fuel and electricity usage, the other major source of STDC's emissions comes from vehicle usage. Table 4 summarises the number and type of vehicles operated by Council.

Table 4: STDC fleet composition in the 2019/20 financial year

Vehicle fuel type	Vehicles in 2019/20 year	Vehicles in 2017/18 baseline year
Petrol	14	35
Diesel	22	9
Hybrid	1	0
Electric	1	0
Total Fleet Size	38	44

Fuel for STDC's diesel vehicles accounts for 10% of STDC's organisational emissions footprint and fuel for STDC's petrol vehicles account for 3% of STDC's organisational footprint (see Figure 2). Transitioning as many vehicles as possible to full electric and/or hybrid will make a significant reduction to STDC's organisational footprint.

Other emissions sources

Together, natural gas (33%), electricity (37%), and vehicle fuel (13%) account for 83% of STDC's overall emissions profile. The remaining 17% of emissions come from Scope 3 emissions.

The largest of these emission sources is fuel and energy related emissions (13%). This emissions source accounts for energy that is used to create and transmit/transport power and fuel, but is not directly consumed by the consumer (ie. power needed for fuel production and energy lost in transmission/distribution). STDC does not have direct control over this emissions source, so it cannot be reduced by our actions.

Another notable source of Scope 3 emissions is organisational waste (2%). These emissions come from the rubbish that STDC owned facilities send to landfill (campsites, Admin building, TSB Hub, etc). In landfill, any organic material decomposes and creates methane, a powerful GHG. This emission category accounts for that methane production caused from STDC facilities sending waste to landfill.

Business travel is also included as a Scope 3 emissions source, contributing 1% of STDC's emissions footprint. Business travel emissions cover airfare (174 flight legs taken in 2019/20), accommodation, and taxi usage.

Finally, upstream freight and purchased goods and services (paper only) are included as Scope 3 emission sources. However, these emission sources are minor at <1% each.

Inventory comparison to other Councils

STDC's organisational emissions profile can be compared to other Councils with a similarly sized population base that have reported on their emissions (see Table 5).

Table 5: GHG emissions of comparable local authorities in New Zealand

Organisation	Report year	GHG scopes	District population	Total tonnes CO_2-e
Kāpiti Coast District Council[7]	2018/19	1, 2, and 3 (partial)	56,000	2,867
Masterton District Council[8]	2018	1, 2, and 3 (partial)	26,800	752
Waitaki District Council[9]	2018/19	1, 2, and 3 (partial)	22,308	2,876

While this report places STDC's emissions profile at 1,216 tonnes CO_2-e for 2019/20, Waitaki District Council (similar population base) reported 2,876 tonnes CO_2-e for 2019/20, with wastewater treatment emissions accounting for 36% of emissions. Once wastewater treatment data is included in STDC's emissions profile (see Appendix 3: New and excluded emission sources), it is likely that STDC's annual emissions will be more closely aligned with the Waitaki District Council figures displayed in Table 5.

[7] Kāpiti Coast District Council, 2018/19: Greenhouse gas emissions inventory report 2018/2019
[8] Masterton District Council, 2018: Greenhouse gas emissions inventory report 2019/2020
[9] Waitaki District Council 2018/19: Greenhouse gas emissions inventory report 2018/2019

Recommendations

There are many ways that STDC can reduce and offset its organisational emissions. Key recommendations are discussed below.

1.0 Energy audits of key facilities

The use of purchased electricity and natural gas currently make up 69% (37% for electricity and 33% for natural gas) of STDC's organisational emissions profile. Energy audits are an ideal tool to begin to understand how to reduce these emissions, prioritising our largest emitting facilities first.

The STDC facilities with the highest electricity and/or natural gas usage include: Hāwera Aquatic Centre, WWTPs, TSB Hub, and the Administration Building. To support the strategic use of energy audits and subsequent implementation of energy audit findings, the Environment and Sustainability has recently reinstated the Energy and Sustainability Forum (ESF). The ESF is comprised of key asset and facility management staff from across all Groups of STDC.

The primary role of the ESF is to make strategic decisions on the most cost-effective and efficient way to systematically reduce our organisational emissions. The ESF (via the Environment and Sustainability Team) will seek co-funding from the Energy Efficiency and Conservation Authority (EECA) to conduct energy audits on our largest emitting facilities, beginning with the Hāwera-Eltham-Normanby Wastewater Treatment Plan, the Aquatic Centre, and the main Admin Building in September 2021.

Energy audits will result in technical recommendations for infrastructure and technology upgrades that can reduce emissions and improve energy efficiency (and associated running costs). These facility-specific recommendations can then be assessed with the relevant facility managers and SLT on a case-by-case basis. Energy audits over the current LTP (2021-2024) will be used to inform energy efficiency infrastructure business cases for the next LTP (2024-2027).

2.0 Fleet transition to hybrid and electric vehicles

Emissions from petrol and diesel used in Council vehicles represent 13% of Council's current emissions profile. Transitioning to a hybrid and electric vehicle fleet is the most direct way that STDC can reduce these emissions while also reducing annual fuel costs.

In 2019, STDC had 38 vehicles - 22 diesel, 14 petrol, 1 hybrid, and 1 electric. Each Council vehicle serves a unique purpose, and some vehicles/uses are more suited to transition to hybrid or electric technology than others.

For example, many hybrid passenger vehicles on the New Zealand market are now cost competitive upfront with petrol-powered passenger alternatives, while offering month to month savings in the form of reduced fuel costs.[10] This stands in contrast to high-power 4WD and/or utility vehicles, which currently have few price-competitive hybrid or electric models available in the New Zealand market.

[10] Genless 2021. Vehicle total cost of ownership tool.

Electric vehicle technology is evolving rapidly, and with the Government's recently announced Clean Car Discount,[11] electric vehicles are expected to become increasingly price competitive in the New Zealand market.

Due to the evolving nature of hybrid and electric vehicle technology, STDC's fleet should be assessed on a yearly basis as vehicles come up for replacement. The Environment and Sustainability team is currently working with Support Services to identify vehicles up for renewal in 2021/22 that would be ideal candidates for switching to hybrid or electric technology.

3.0 Offsetting emissions we can't reduce with native reforestation

As a part of STDC's Te Rautaki Toitū Te Taiao – Environment and Sustainability Strategy, Council is reforesting 2 hectares of Council owned land per year over the next three years. The first reforestation planting was completed in Pātea in the winter of 2021, and is aimed at offsetting emissions we can't directly reduce through Recommendations 1 and 2 above.

This co-funded forestry project is a flagship project for Council, and will result in numerous measurable benefits for ratepayers, our communities, and the natural resources of our District. These benefits will include:

- Offsetting a portion of Council's carbon emissions that we can't reduce through other means;
- creating a long-term investment portfolio for Council via New Zealand Unit (NZU) carbon credits in the New Zealand Emissions Trading Scheme (NZETS);
- improving and enhancing biodiversity, habitat values and forest cover for native species across the District;
- increasing the amenity and recreation values of bare Council land; and
- improving water quality and erosion control along riparian strips and/or steep hill country.

If Council plants significantly more forestry than the amount required to offset all organisational emissions, Council will be able to sell or trade NZU carbon credits from that forestry on the national or international markets.[12] Thus, STDC could effectively "sell" any additional carbon credits to other companies for their offsetting, based on the NZU value of the planted land. This would not affect the ownership of the land and could become a significant investment portfolio over time.

[11] New Zealand Government 2021. Clean car package to drive down emissions
[12] MPI, 2019. Forestry and the Emissions Trading Scheme

4.0 Inclusion of additional emission sources in future reports

There are several emission sources that are not yet included in STDC's emissions profile, due to a lack of available data. Table 6 displays some of the largest emission sources that are currently excluded from STDC's emissions profile.

For most Councils and organizations, forming a comprehensive emissions profile takes many years as new emissions sources are understood and added on a yearly basis. In addition, there is ongoing scientific development around how best to calculate emissions from a variety of sources. This will mean we will continue to incrementally improve the accuracy of our emissions profile over time.

Over the coming years, the Environment and Sustainability team will work with other Business Units across Council to make STDC's emissions inventory more complete and improve the adequacy and accuracy of the required data collection (see Table 6).

Table 6: Emission sources to add to STDC's profile in future years

Emissions source	Data needed	Data location	Business Unit
Wastewater treatment	Water inflow and treatment plant design specifications	Water Outlook and WWTP technical plans	Engineering, Wastewater Treatment
Construction and demolition projects	Total weight of construction materials used (and material type) + funds spent on demolition	Contractor materials lists and finance records	Varies by project
Investment related emissions	Investment amounts, STDC's equity share in each investment, investment company GHG reporting (if available), and investment category type	Investment records and investment company GHG reporting (if available)	Finance
Employee commute	Employee survey to query employee commute	Not yet available, employee survey needed	HR
Purchased goods and services (other than paper)	Spend amount for various purchase categories across all teams and groups	Finance records	Finance
Forestry harvest and sequestration	Hectares of planted or harvested forest, forest age, and forest type	Property records and Environment and Sustainability team records (for native reforestation)	Property and Environment and Sustainability

Emissions Reduction Plan

To reach our net zero carbon organisation target by 2035, STDC will have to make dramatic reductions in emissions year on year. To reach the 2035 goal, STDC will have to reduce its emissions footprint by an average of 89.29 tonnes per year until 2035 (see Figure 3).

Over the next five years STDC will need to reduce its emissions footprint by 446.45 tonnes CO_2-e. This five-year goal could be met by finding a renewable solution for the Hāwera Aquatic Centre natural gas use (potential savings of 381 tonnes CO_2-e) and by reducing organisational electricity usage by 15% (potential savings of 68 tonnes CO_2-e). Switching to hybrid/electric vehicles would also yield emissions savings in the short term. It is important to note that as STDC acquires the data needed add in new emission sources to its profile, the required annual CO_2-e reductions will correspondingly change.

Long term, it will become more difficult for STDC to reduce its emissions after "easy wins" have been achieved. For some emissions that can't be reduced/eliminated, STDC can use sequestration credits from reforestation as offsets (see Appendix 5: Forestry emissions and offsets).

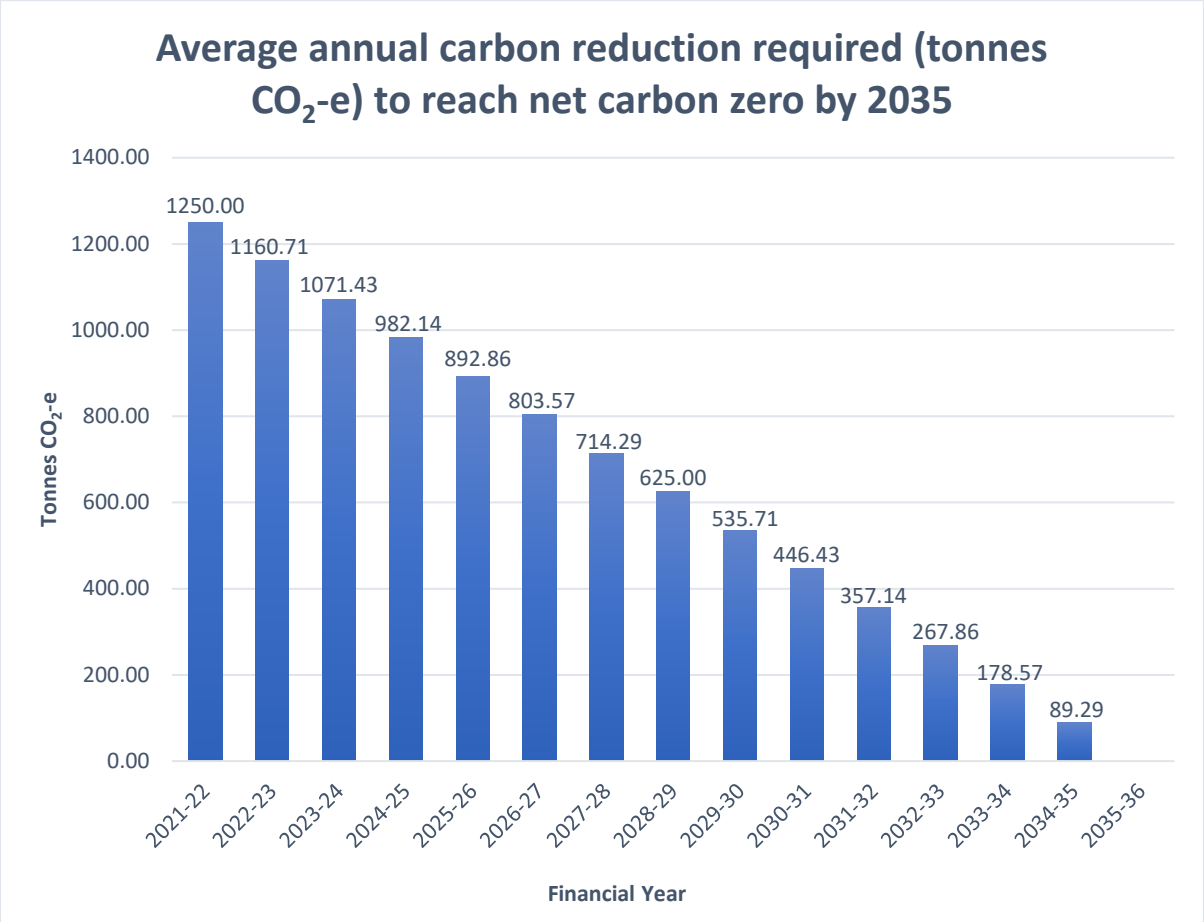


Figure 3. Emission reduction requests to reach net zero carbon by 2035

Conclusion

The goal set forth in STDC's Te Rautaki Toitū Te Taiao – Environment and Sustainability Strategy to reach net carbon zero status by 2035 is ambitious but achievable. To reach this goal, STDC will have to reduce its emissions footprint by an average of 89.29 tonnes per year each year until 2035. Understanding the scale and source of Council's emissions is the first important step towards reaching that goal.

This report summaries STDC's emissions profile for the 2019/20 financial year. Scope 1 and Scope 2 emissions were included in the inventory, along with a selection of Scope 3 emissions. This emissions inventory represents both the first time STDC has completed an externally reviewed inventory and the first time STDC has included any Scope 3 emissions sources.

Of the 1,216 tonnes CO_2-e STDC emitted in 2019/20, 33% came from natural gas (mostly the Hāwera Aquatic Centre), 37% came from purchased electricity, and 13% can from vehicle usage. The remaining 17% came from fuel and energy related emissions (13%), business waste (2%), business travel (1%), backup generators (.4%), outdoor machinery (.2%), purchased goods and services – paper (.3%) and upstream freight (.08%).

To reach net carbon zero status by 2035, STDC will need to radically reduce and off-set its emissions. Targeting Council's largest sources of emissions (Hāwera Aquatic Centre, WWTPs, Admin Building, and TSB Hub) will be the most effective way to meet reduction goals. Transitioning STDC's fleet to become increasingly hybrid and electric will also be a key source of emission reductions.

Once "easy wins" for emission reductions are completed, it will become more difficult for STDC to reduce its emissions profile. At this point, carbon sequestration offset credits will become an important emissions management tool. Reforestation on Council owned land can allow Council to claim emissions offsets in future years. To begin the process of establishing emission offsets, over the next three years STDC will be reforesting two hectares of Council owned land per year. Aiming to increase the area of land planted per annum will have numerous benefits for Council and the wider district, aside from organisational emissions offsetting.

Taken together, these efforts will help to achieve STDC's goal of being a net carbon zero organisation by 2035.

Appendix 1: Legislative and Technical Requirements

Climate Change Response (Zero Carbon) Amendment Bill

Council will need to be compliant with the provisions of the Climate Change Response (Zero Carbon) Amendment Bill (New Zealand Government, 2019).[13] This legislation established an independent He Pou a Rangi, Climate Change Commission (CCC). The CCC now advises the government on how to meet targets set by the Zero Carbon Amendment Bill. The overarching target is for New Zealand to have net zero carbon emissions by 2050.

Clauses in the Zero Carbon Amendment Bill describe how the Minister and/or CCC will set national, regional and district-level emissions targets, report on progress against these targets, and implement compliance monitoring.

However, the Minister/Commission will only be able to report on the above variables, and monitor targets towards emissions reduction, by requiring Councils to report on their District's emissions data, and their implementation of climate change adaptation and mitigation plans.

Compliance with the Zero Carbon Amendment Bill requirements will rely on STDC having begun:

a) emissions inventories and emissions reduction target setting for the organisation, and;
b) undertaking and implementing District-wide climate change risk assessment, impact and adaptation plans.

Therefore, the development of this emissions inventory for STDC is an important step towards addressing the legislative requirements of the Zero Carbon Bill (discussed in detail in the LTP 2021 Issues and Options Paper for Environment and Sustainability),[14] demonstrating community leadership on climate change mitigation actions and goal setting, and meeting the expectations of our communities as we transition towards a low emissions future.

Greenhouse gases and global warming potential

This report focusses on the four main gasses that contribute to GHG emissions, as outlined in the Paris Agreement (UNFCCC, 2015)[15] and the New Zealand National Greenhouse Gas Inventory Report (MFE, 2021).[16] These gases include carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and fluorinated gases (F-gases).

These four GHGs (or, in the case of fluorinated gases, groups of GHGs) are the focus of emissions reporting because of their ability to absorb heat and their relatively long lifespan in the atmosphere. The common sources and relative warming capacities of these gases are as follows:

[13] New Zealand Government, 2019. Climate Change (Zero Carbon) Amendment Bill
[14] STDC LTP Issues and Options Paper, 2021. LTP 2021-2031 - Issues and Options Paper - Environment and Sustainability
[15] UNFCCC, 2015. Paris Agreement
[16] MFE, 2021. New Zealand's Greenhouse Gas Inventory

- **Carbon dioxide (CO_2)** is added to the atmosphere primarily through the combustion of fossil fuels (coal, oil, and gas), and from some chemical reactions, such as the production of cement. Once emitted, it can remain in the atmosphere for thousands of years. CO_2 is removed from the atmosphere primarily through photosynthesis and biomass production from growing plants, and through dissolution in the oceans.
- **Methane (CH_4)** is emitted by livestock and the decomposition of organic matter (such as in landfills or wastewater treatment ponds), as well as during the production and transportation of coal and natural gas. Over a span of 100 years, CH_4 is 25 times more effective than CO_2 at trapping heat in the atmosphere, despite its average lifetime in the atmosphere of about 12 years.
- **Nitrous oxide (N_2O)** is emitted primarily from agriculture, but also industrial processes and fossil fuel combustion. Over a span of 100 years, it is 298 times more effective than CO_2 at trapping heat and has an average atmospheric lifespan of 114 years.
- **Fluorinated gases (F-gases)** are very strong human-made GHGs used in products such as refrigerators and air conditioners. Emissions of F-gases to the atmosphere occur during production of these types of products, and through losses during their use. The average lifespan of F-gases in the atmosphere vary from days to 50,000 years.

Throughout this inventory, methane (CH_4), nitrous oxide (N_2O), and fluorinated gases (F-gases) emissions are converted into kilograms and tonnes of effective CO_2 (CO_2-e). This conversion is done by multiplying the actual emissions by the appropriate global warming potential (GWP) conversion factor. This report utilises GWPs provided by the MFE detailed guide on best-practice for organisational emissions reporting (see Table 7).[17] F-gases are not included in this table, as there are numerous different refrigerants that fit into the F-gas group, each with its own GWP.

Table 7. Global warming potential (GWP) of greenhouse gases based on a 100 year period

Greenhouse Gas	Scientific Notation	Global Warming Potential (GWP)
Carbon dioxide	CO_2	1
Methane	CH_4	25
Nitrous oxide	N_2O	298

Organisational boundaries and scope

Organisational boundaries determine what emissions sources fall within the responsibility purview of an organisation. Setting organisational boundaries is required by the methodology in the ISO 14064-1: 2018 Standard, which allows for either of two approaches:

- **Control:** the organisation accounts for all quantified GHG emissions and/or removals from facilities over which it has financial or operational control; or
- **Equity share:** the organisation accounts for its portion of GHG emissions and/or removals from respective facilities.

This GHG inventory takes an operational control approach to account for emissions. This approach allows STDC to focus on the emission sources over which the organisation has day-to-day, operational control. For a summary of the operations that STDC controls, see Appendix 2: Organisational description.

[17] MFE, 2020. Measuring emissions: A guide for organisations. Detailed Guide 2020.

For standardised emissions inventories, GHGs are broken down into scopes. This emissions inventory uses the standard scopes presented by MFE.[11] These scopes include:

- **Scope 1:** Direct GHG emissions from sources owned or controlled by the company
- **Scope 2:** Indirect GHG emissions from the generation of purchased energy (in the form of electricity, heat, or steam) that the organisation uses.
- **Scope 3:** Other indirect GHG emissions occurring because of the activities of the organisation but generated from sources that it does not own or control (eg. air travel).

MFE currently provides guidance for Scope 1, Scope 2, and Scope 3 emissions and has assigned six categories that stretch across these scopes. Multiple emissions sources are assigned to each of these six categories. See Table 8 for a list of MFE identified scopes, categories, and emissions sources for 2019. Each year MFE updates this Table to include new/modified categories and emission sources.

Table 8. Greenhouse gas emissions by MFE scope, category, and source.

Scope	Category	Direct/Indirect emissions and removals	Source
Scope 1	Category 1	Direct GHG emissions and removals	Fuel
			Refrigerant and medical gases*
			Agriculture, forestry and other land uses
Scope 2	Category 2	Indirect GHG emissions from imported energy	Purchased energy
Scope 3	Category 3	Indirect GHG emissions from transportation	Business travel
			Staff commute
			Freight transport
			Refrigerant use (from chilled transport or air conditioner)
	Category 4	Indirect GHG emissions from products an organisation uses	Transmission and distribution losses
			Working from home
			Water supply and wastewater treatment
			Materials and waste
	Category 5	Indirect GHG emissions (use of products from the organisation)	Outside the scope of this guide
	Category 6	Indirect GHG emissions (other sources)	

Appendix 2: Organisational Description

The purpose of local government, as outlined in the Local Government Act 2002,[18] is to meet the current and future needs of communities for good quality local infrastructure, local public services and the performance of regulatory functions in a way that is most cost effective for households and businesses.

The South Taranaki District Council works towards this purpose through our Mission Statement and Community Outcomes and use these to guide us when making decisions, developing policies, strategies or determining priorities.

STDC provides the following services via our structural units:

- **Democratic Processes**: The Mayor, Councillors and Community Board members are elected by a triennial public vote. They function as governing bodies, sitting above the STDC Chief Executive (Figure 3), for determining policies and strategies for STDC's activities, investments, borrowings, partnerships with other agencies, setting annual rates and charges and approving Long Term and Annual Plans.
- **Cultural Services**: STDC promotes activities for community participation through the arts and restoring and preserving cultural heritage.
- **Recreation and Leisure**: STDC maintains all Council-owned and operated parks and reserves, town halls, venues, public restrooms, holiday parks, rural pools and the Aquatic centre.
- **District Economy**: STDC assists and advises local businesses through the Economic Development Strategy, and actively works towards improved broadband and mobile services, tourism development and the provisions of recreational and cultural activities for bringing communities together.
- **Community and Social Development:** STDC actively works with communities and other partnerships for planning, projects, and initiatives. Council owns and operates pensioner housing for elderly residents for the safety and comfort of its residents.
- **Environment and Coastal Development:** STDC administers and manages the District Plan, provides advice on property and subdivisions, land use, consents and licensing, as well as environmental enhancement work and environmental sustainability. Coastal Development works on preserving the marine environment and ensuring access to beaches and lakes.
- **Roading and Footpaths:** STDC is responsible for the development and maintenance of cycleways and walkways for linking recreational spaces with urban centres and maintaining roadways for safe travel and access to facilities.
- **Three Waters Operations:** STDC manages 1) water supply to the District for safe drinking water, 2) storm water for decreased risk of flooding, and 3) the treatment of wastewater for public and environmental health purposes.
- **Waste:** STDC contracts out the management of solid waste services for the District's residential areas. This service provides free recycling services with an opt-in green waste service. Council owns and operates seven transfer stations and works collaboratively with Stratford District Council and New Plymouth District Council for regional waste disposal and waste minimisation activities.

[18] NZ Govt, 2002. Local Government Act 2002 - Local Government Act 2002

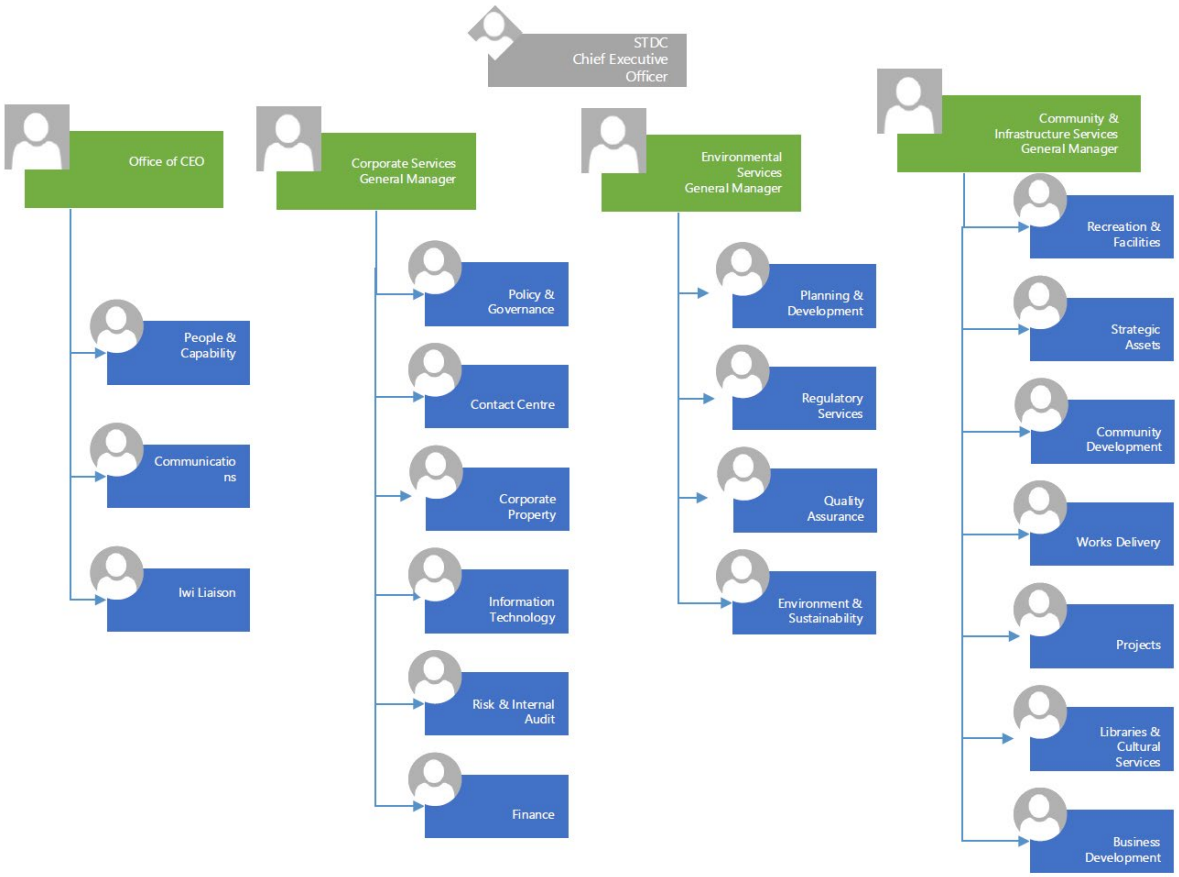


Figure 4: STDC structural units showing where responsibility sits for the calculation of emissions based on organisational boundaries

Appendix 3: New and Excluded Emission Sources

New emission sources for 2019/20

In past emission inventories, STDC has only reported on Scope 1 and Scope 2 emissions due to the previous lack of data available for Scope 3. However, this does not represent a full accounting for STDC's organisational emission footprint. For this 2019/20 profile, a selection of Scope 3 emissions has been included for the first time, where data was available.

New Scope 3 additions to the 2019/20 emissions profile include: business travel, transmission and distribution losses + fuel production related emissions (fuel and energy related emissions), purchased goods and services – paper, inward freight, and organisational waste.

While new Scope 3 emissions sources have been included in this inventory, there are still many emissions sources within STDC's organisational boundary that are not included due to a current lack of data (see "Excluded emissions sources" section below). In future years, the Environment and Sustainability team will continue to work to include additional emissions sources in STDC's emissions profile.

Excluded emissions sources

The inclusion of wastewater treatment data will be a particular focus of STDC emissions inventories in future years. The addition of wastewater treatment emissions is likely to dramatically increase STDC's overall emissions profile. As the organic matter contained in wastewater breaks down, large amounts of nitrous oxide (N_2O) and methane ($CH_{4)}$ are produced. The high Global Warming Potential (GWP) of these gases (N_2O: GWP of 298 and CH_4: GWP of 25) can result in a large additional emissions footprint. However, STDC does not currently have adequate data on organic matter on our wastewater treatment ponds to be able to calculate these emissions.

For example, Christchurch City Council has recently calculated that wastewater treatment constitutes over half of the Christchurch City Council greenhouse gas profile.[19] Once STDC includes wastewater treatment data, it is reasonable to expect STDC's emissions footprint to increase anywhere from 30%-50%. Additionally, this will be a difficult emissions source to reduce, given the organic matter comes from residents across the District, and is not something we can necessarily directly control or easily reduce, unless we begin to investigate alternative wastewater treatment methods, like anaerobic digestion and biogas production, for example.

Another notable source of emissions that has been excluded from this 2019/20 organisational footprint is forestry and land use change. STDC owns a small number of *Pinus radiata* forestry plots (See Appendix 5: Forestry emissions and offsets). In 2019/20, STDC harvested three forestry plots. Harvesting emissions and carbon sequestration (for the unharvested plots) forestry calculations (which have not been externally reviewed by EKOS Ltd) are shown in Appendix 5: Forestry emissions and offsets.

[19] Wallace et. al, 2020. IPCC Emissions Factors – Challenging a Fortyfold Jump in Nitrous Oxide.

There are also many other important Scope 3 emissions sources that have not been included in this inventory due to a current lack of data (see Recommendations section). Some of these Scope 3 emission source exclusions include: construction and demolition projects (eg. Te Ramanui), purchased goods and services (beyond paper), employee commuting, and investment related emissions. The Environment and Sustainability team will continue to work to identify the required data streams to quantify these additional emissions sources and integrate them into future profiles.

Appendix 4: Detailed Calculations

Unless otherwise noted, all GWP emissions factors cited in Appendix 4 have been obtained from MFE's 2020 Measuring Emissions: A Guide for Organisations.[20]

Scope 1 Emissions

Fuel – Sources

STDC uses diesel and petrol to fuel most of its fleet vehicles and natural gas is used for heating, especially at our Hāwera Aquatic Centre. STDC also uses diesel to power generators (which are generally used as back-up power sources) and petrol for outdoor machinery (lawn mowers, etc).

In the 2019/20 financial year, STDC emitted a total of 556.35 tonnes CO_2-e from its combined fuel sources (Table 9). The Table 5 figures are not full fuel-cycle emission factors and do not incorporate indirect (Scope 3) emissions associated with the extraction, production, and transportation of fuel.

Table 9: Summary of fuel used by STDC over the 2019/20 financial year

Fuel source	Unit	STDC Use	Tonnes CO_2-e
Petrol (vehicles)	L	16,328.26	40.04
Diesel (vehicles)	L	45,664.22	123.02
Petrol (outdoor machinery)	L	1,079.96	2.64
Diesel (backup generators)	L	1,974.00	5.26
Natural Gas	kWh	1,997,593.64	387.53

Stationary fuel

Stationary fuel includes natural gas and fuel from outdoor machinery and generators.

The use of natural gas makes up the largest portion of STDC's fuel emissions. In the 2019/20 financial year, STDC used a total of 1,997,594 kWh of natural gas. This figure comes from STDC's eBench profile.

To calculate emissions associated with this natural gas usage, MFE's recommended emissions factor of 0.194 kg CO_2-e/kWh was used.

Calculated natural gas emissions in tonnes CO_2-e: Kwh x GWP

kWh = Kilowatt hours

GWP = Global Warming Potential (100-year potential)

Natural gas emission = Kwh x GWP=1,997,594 x .194 = 387,533.24 kg CO_2-e = 387.53 tonnes CO_2-e

[20] MFE 2020. MFE detailed emissions guide

Stationary fuel also includes petrol outdoor machinery and diesel backup generators. To calculate emissions associated with petrol and diesel usage, MFE's recommended emissions factors for stationary fuel of 2.451 kg CO_2-e /litre (petrol) and 2.663 kg CO_2-e /litre (diesel) were used.

Petrol emissions, outdoor machinery, in tonnes CO_2-e: L x GWP

L = Litres
GWP = Global Warming Potential (100-year potential)

Petrol emissions = L x GWP = 1,079.96 x 2.451= 2,649.98 kg CO_2-e = 2.65 tonnes CO_2-e

Diesel emissions, backup generators in tonnes CO_2-e: L x GWP

L = Litres
GWP = Global Warming Potential (100-year potential)

Diesel emissions = L x GWP = 1,974 x 2.663 = 5,256.76 kg CO_2-e = 5.26 tonnes CO_2-e

Collectively, STDC's stationary fuels account for 395.44 tonnes CO_2-e (387.53 tonnes CO_2-e from natural gas + 2.65 tonnes CO_2-e from petrol outdoor machinery + 5.26 tonnes CO_2-e from diesel backup generators).

Vehicles

Fuel for petrol and diesel vehicles also make up a large portion of STDC's overall fuel usage. To calculate emissions associated with petrol and diesel usage, MFE's recommended emissions factors of 2.452 kg CO_2-e /litre (petrol) and 2.694 kg CO_2-e /litre (diesel) were used. For petrol, STDC used 16,328.26 litres in fleet vehicles. This figure comes from STDC's eBench profile.

Petrol emissions in tonnes CO_2-e: L x GWP

L = Litres
GWP = Global Warming Potential (100-year potential)

Petrol emissions = L x GWP = 16,328.26 x 2.452 = 40,036.89 kg CO_2-e = 40.04 tonnes CO_2-e

For diesel, STDC used 45,664.22 litres in fleet vehicles. This figure comes from STDC's eBench profile.

Diesel emissions in tonnes CO_2-e: L x GWP

L = Litres
GWP = Global Warming Potential (100-year potential)

Diesel emissions = L x GWP = 45,664.22 x 2.694 = 123,019.41 kg CO_2-e = 123.02 tonnes CO_2-e

Technical notes and assumptions for fuel source calculations:

- **Petrol:** The default petrol factor for premium and regular petrol is a weighted average provided by the Ministry for Environment, which is pulled from pooled fuel sales data around New Zealand. This average is assumed to be representative of all fuel calculated in this summary. Petrol usage by STDC was calculated as whole and premium was not split out from this.
- **LPG:** LPG is not used by STDC and is not reported in our organisation figures.
- **Natural Gas:** It is assumed that natural gas is predominantly methane and therefore all leakage is calculated as methane (CH_4) before being converted into CO_2-e.

Refrigerants

Greenhouse gas emissions from hydrofluorocarbons (HFCs) are associated with leaks and spills (seepage) from refrigerator units, air conditioners and heat pumps. HFCs have a very high GWP, which can be up to 3,300 times more potent than carbon dioxide.

CO_2-e emissions from STDC refrigerant usage were calculated using Method B in the MFE Guide, as per the following formula, which uses assumptions and default values. See Table 10 for a summary of STDC's refrigerant usage.

Table 10: Summary of all Refrigerants used by STDC over the 2019/20 financial year

Refrigerant	Chemical Formula	Unit	Total Input
HFLC - R410A	Blend R-32/ 125 (50.0/50.0)	kg	2

Refrigerant emissions in kg CO_2-e: OE x GWP

Where:
TU = Refrigerant top up required, in Kg by gas type
GWP = Global Warming Potential (100-year potential)

Refrigerant emissions = TU x GWP = 2 x 2,088 = 4,176 kg CO_2-e = 4.18 tonnes CO_2-e

Based on the above equation, STDC's refrigerant emissions were equivalent to 4.18 tonnes CO_2-e for the 2019/20 financial year, which is a relatively small figure when compared to the total organisation emissions for the time period (1,216 tonnes CO_2-e).

Technical notes and assumptions for refrigerant source calculations:
For the purposes of this report, it was assumed that all air-conditioning units installed throughout STDC offices and venues were of a similar 3.5 kW cooling capacity.

Global Warming Potential was assessed from the type of refrigerant used, and it was assumed that each unit contained the same type of HFC blend of R410A (GWP of 2,088).

Method B assumed a leakage rate pulled from Appendix B of the MFE Measuring Emissions Detailed Guide, 2019. This leakage rate was 3% per annum and was assumed to apply to every unit.

It was assumed that every unit contained 875g of refrigerant when installed.

It was assumed that air-conditioning units installed in offices and buildings for heating/cooling purposes were the only large-scale emissions source of refrigerants for STDC as an organisation.

Scope 2 Emissions

Purchased energy in the form of electricity, heat or steam, is classed as an indirect (Scope 2) emission and is therefore reported from the point of usage onwards, rather than from the point of generation. Electricity generation is provided by a third party from the national grid and is not owned or controlled by STDC.

Electricity

Electricity emissions come from the combustion of fossil fuels, such as coal, oil, and natural gas. In New Zealand, electricity also comes from renewable sources. Electricity generation predominantly produces carbon dioxide emissions, but it also releases small amounts of methane and nitrous oxide into the atmosphere.

STDC uses purchased electricity to power the organisation's operational activities for the District, and to provide lighting, heating and power for public areas and facilities.

STDC's organisational electricity usage figures include, but are not limited to:

- Power to STDC administration offices and buildings for heat pumps, lighting, computers, printers, and staff facilities etc;
- Heating and lighting for community and sports facilities;
- Running water treatment and wastewater treatment plants;
- Running streetlights and public outdoor lighting;
- Heating, lighting and power for venues and public toilets;
- Heating, lighting and power for public facilities such as the Libraries and I-site centres.

In the 2019/20 financial year, STDC used a total of 4,482,569 kWh of electricity. This figure comes from STDC's eBench profile.

To calculate emissions associated with this electricity usage, MFE's recommended emissions factor of .101 kg CO_2-e/kWh was used. This emissions factor is the purchased-electricity grid average for New Zealand.

Electricity emissions in tonnes CO_2-e: kWh x GWP

Where:
kWh = Kilowatt hours
GWP = Global Warming Potential (100-year potential)

Electricity emissions = kWh x GWP = 4,482,569 x .101 = 452,739.47 kg CO_2-e = 452.74 tonnes CO_2-e

Technical notes and assumptions for electricity source calculations:
For the purposes of this report, electricity usage reported was based on third party supplier charges for actual usage of kilowatt hours, sourced from STDC's eBench profile. It was assumed these charges were an accurate representation of usage. It was assumed that all data extracted from Council's eBench database was correct and up to date.

The amount of emissions produced per kWh is defined by geographical location, time of day and time of year which affects the carbon intensity of the grid. The emission factor used in these calculations was assumed to be a consistent with the MFE grid-average emissions factor of 0.101 Kg CO_2-e per kWh. This metric and does not take spatial and temporal factors into consideration.

Scope 3 Emissions

Scope 3 emissions are indirect GHG emissions that occur because of activities that an organisation undertakes but are originally generated by sources that the organisation does not own or control.

Purchased goods and services

This inventory includes emissions from one of STDC's purchased goods and services categories – paper. Future inventories will aim to include further purchased goods and services (ie. catering, phone service, etc).

To calculate emissions associated with purchased goods and services – paper, the amount of paper used was gathered from STDC's annual Office Max Emissions Report (3.225 tonnes). STDC's external review (EKOS Ltd) then provided the CO_2-e estimation for of 3.39 tonnes CO_2-e.

Fuel and energy related emissions

The next Scope 3 (indirect) emissions source included in this inventory is fuel and energy related emissions. This includes emissions associated with fuel and energy production as well as transmission and distribution losses.

To calculate fuel and energy related emissions, STDC's amount of fuel and electricity usage was gathered from eBench. STDC's external review (EKOS Ltd) then provided the CO_2-e estimation for of 156.91 tonnes CO_2-e for fuel and energy related emissions.

Upstream freight

Upstream freight includes shipping emission for materials being delivered to STDC.

To calculate emissions associated with upstream freight, annual Office Max emissions report was used. This report shows .9225 tonnes CO_2-e for upstream freight emissions for STDC Office Max delivery. It should be noted that this figure only represents a portion of what is shipped to STDC (since suppliers other than Office Max are also utilised to deliver goods).

Business travel

Business travel - flights

STDC paid for a total of 174 flight legs in the 2019/20 financial year for a total of 51,200 km flown. This figure was obtained from Air New Zealand reporting. See Table 11 for a summary of all STDC purchased flights.

Table 11: STDC flights taken during the 2019/20 financial year

Origin	Destination	Distance (kms)	Legs flown
Auckland	Christchurch	1,077	2
Auckland	Gisborne	460	4
Auckland	New Plymouth	343	75
Auckland	Rotorua	226	2
Auckland	Wellington	650	1
Christchurch	Dunedin	239	4
Christchurch	New Plymouth	804	12
Christchurch	Palmerston North	579	2
Christchurch	Wellington	444	5
Dunedin	Wellington	828	8
New Plymouth	Wellington	379	59
		Total	**174**

The MFE methodology for domestic air travel was used to calculate emissions. Under this methodology, the number of passenger kilometres (pkm) flown is multiplied by an emissions factor.

The flight emissions factor utilised in this inventory is .242 kg CO_2-e/pkm. This is the natural average for domestic aviation with a radiative forcing multiplier of 1.9 applied. Radiative forcing accounts for the emissions released at higher altitudes having a higher global warming potential.

Calculated flight emissions in tonnes CO_2-e: pkm x GWP

Where:
pkm = Passanger kilometres
GWP = Global Warming Potential (100-year potential)

Flight emissions = pkm x GWP = 51,200 x .242 = 12.39 kg CO_2-e = 12.39 tonnes CO_2-e

Accommodation

The total number of nights booked for staff travel in 2019/2020 was obtained from STDC's finance system. Over the 2019/2020 financial year, STDC booked 24 nights of accommodation. All accommodation was domestic (in New Zealand).

To calculate emissions associated with this accommodation, MFE's recommended emissions factor of 12.38 kg CO_2-e/room per night was used. This emissions factor is an average for New Zealand accommodation.

Calculated accommodation emissions in tonnes CO_2-e: Q x F

Where:
Q = Rooms per night
F = Emission factors for the country stayed in

Accommodation emissions = Q x F = 24 x 12.3 = 295.20 kg CO_2-e = .30 tonnes CO_2-e

Taxi rides
For taxi travel, a record of taxi rides taken by staff on business travel was obtained from Support Services. This record indicated a total of 92 taxi rides and 1,141.70 kms travelled. The MFE recommended GWP emissions factor of .225 kg CO_2-e/km was utilised.

Calculated taxi ride emissions in tonnes CO_2-e: Kms x GWP

Where:
Kms = Kilometres travelled
GWP = Emission factor for taxi rides

Taxi ride emissions = Kms x GWP = 1,141.70 x .225 = 256.88 kg CO_2-e = .26 tonnes CO_2-e

Organisational waste

Organisation waste includes all rubbish that STDC offices and facilities send to landfill. This does not include STDC's kerbside collection or transfer station services. To calculate organisational waste emissions, refuse collection invoices were gathered for all STDC office and facilities.

In the 2019/20 financial year, STDC offices and facilities sent a total of 568,940 kgs and a sperate 1,150 litres of refuse to landfill.

To calculate emissions associated with organisational waste, these figures were given to EKOS Ltd. EKOS Ltd then provided an estimation of 23.37 tonnes CO_2-e for organisational waste emissions.

Appendix 5: Forestry Emissions and Offsets

The South Taranaki District Council currently owns the forestry rights to *Pinus radiata* trees within several forestry blocks, detailed in Table 11 (for the Galway Bay blocks, STDC owns rights to the trees only, not the land beneath them). Both the forestry harvest emissions and remaining forest carbon sequestration have been excluded from STDC's 2019/20 emissions inventory. Consequently, the calculations made in this Appendix 5 have not been externally reviewed by EKOS Ltd.

At the beginning of the 2019/20 financial year the original area of trees within these forestry blocks was approximately 23.64 hectares. As Table 12 shows, three of STDC's forestry blocks were harvested in 2019/20. Collectively, these harvested forestry blocks covered 16.06 hectares (out of an original forestry area of 23.64 hectares).

Table 12: Forestry rights owned by STDC in the 2019/20 year.

Forest Name	Area (approx. hectares)	Year planted	Year of harvest/expected harvest
Galway Bay (part of partnership block)	4.73	1986	Harvested in 2019/20
Galway Bay (STDC only block, Road Reserve)	2.68	1986	Harvested in 2019/20
Ingahape Road (part of partnership block)	8.65	1986	Harvested in 2019/20
Roberts Block	5.10	1986	Scheduled for harvest in 2020/21, but unable due to access issues.
York St, Patea Property No. 13338 and part 13337	0.31	1995	Awaiting harvesting schedule / harvest pending.
Upper Glenn Road (Gravel Reserve) Property No. 16220	1.47	2005	Due for harvest around 2029.
Ohawe (Esplanade Reserve)	0.70	1995	Awaiting harvesting schedule / harvest pending.
TOTAL	**23.64**		

There are significant emissions associated with these forestry harvests. To calculate emissions associated with the forestry harvest, MFE's planted forest harvest and deforestation GWP of 946,605 CO_2-e/hectare was used.

Calculated forestry harvest emissions in tonnes CO_2-e: ha x GWP

Where:
ha = hectares of forest harvested
GWP = Emission factor planted forest harvest

Forestry harvest emissions = ha x GWP = 16.06 x 946,605 = 15,202,476.30 kg CO_2-e = 15,202.48 tonnes CO_2-e

With an emissions footprint of just over 15,000 tonnes CO_2-e, the harvesting of 16.06 hectares of planted forest represents emissions of more than 10x STDC's current annual emissions footprint. This highlights the need for any future STDC forestry efforts to be solely native, permanent reforestation efforts.

To calculate emissions offsets associated with STDC's remaining unharvested forestry blocks (7.58 hectares), MFE's GWP for planted forests of -33,807 CO_2-e/hectare was used. This represents the average annual increment of sequestration of the typical lifetime of a planted forest (28 years).

Calculated forestry offset emissions in tonnes CO_2-e: ha x GWP

Where:
ha = hectares of forest harvested
GWP = Emission factor planted forest harvest

Forestry offset emissions = ha x GWP = 7.58 x -33,807 = -256,257 kg CO_2-e = -256.28 tonnes CO_2-e

This means that the 7.58 hectares of planted forestry that STDC has remaining is offsetting approximately 21.07% of STDC's current non-excluded emissions footprint. Of the 7.58 hectares of STDC-owned forestry that remains, 6.11 hectares are expected to be harvested in the near future. This means that in future years, STDC will have a small land base of *Pinus radiata* remaining (1.47 hectares) for forestry offset credits.

In winter of 2021, STDC began a reforestation programme, planting two hectares a year of Council owned land in native trees. This effort is currently a three year pilot project. A total of six hectares land will be reforested over the coming three years.

To calculate emissions offsets associated with this six hectare reforestation effort, MFE's GWP for regenerating natural forest of -5,097 CO_2-e/hectare was used. This GWP is notably lower than the sequestration GWP for planted forest (-33,807 CO_2-e/hectare). This is because native forestry does not sequester as much carbon as quickly as typical planted non-native forestry blocks.

Calculated forestry offset emissions in tonnes CO_2-e: ha x GWP

Where:
ha = hectares of forest harvested
GWP = Emission factor natural regenerating forest

Forestry offset emissions = ha x GWP = 6 x -5,097 = -30,582 kg CO_2-e = -30.58 tonnes CO_2-e

This means that once STDC has reforested six hectares of STDC owned land, that reforested land will annually offset 2.51% of STDC's current non-excluded emissions footprint. If STDC can reduce its overall emissions footprint, the footprint percentage that this reforestation scheme can offset will correspondingly increase.

Carbon Inventory Report:
South Taranaki District Council

Period: 2019/2020 financial year

Date: 26th July 2021

ekos.co.nz | ekos@ekos.co.nz

Contents

1 Summary

This carbon inventory was prepared for South Taranaki District Council for the financial year of 2019/2020.

Organisation background	Name: South Taranaki District Council Contact person: Rebecca Martin Contact email: Rebecca.Martin@STDC.govt.nz Area of business: Local Authority Full Time Equivalents (FTEs): 165 Business Description: South Taranaki District Council is the local authority covering the southern West Coast tip of the Taranaki Region. It includes the towns of Hāwera, Manaia, Ōpunakē, Pātea, Eltham and Waverley. It covers an area of 3,575 km^2 and had a population of 28,700 in June 2020.
Report period	July 1st 2019 – June 30th 2020
Organisational boundary	This inventory includes the following sites: All South Taranaki District Council offices within the District, plus community facilities and halls across South Taranaki. This measurement excludes: The activities of services contracted out by South Taranaki District Council, including: waste management (including the landfill used by STDC in the neighbouring authority), road maintenance and construction, water and waste water emissions, after hours regulatory services.

Reporting boundary	Business operations direct and indirect emissions resulting from:
	• Direct (scope 1)
	• Indirect electricity (scope 2)
	• Indirect (scope 3)
	  ○ Purchased goods and services (paper use)
	  ○ Fuel and Energy related emissions
	  ○ Upstream Freight (inward only)
	  ○ Business Waste (landfill waste)
	  ○ Business Travel

Omissions	• Indirect (scope 3)
	  ○ Purchased Goods and Services (water and IT)
	  ○ Capital Goods
	  ○ Upstream freight (outward only)
	  ○ Business Waste (waste water)
	  ○ Employee commute

Emissions	Total emissions: 1,216.23 tCO_2e including radiative forcing

South Taranaki District Council has qualified for Carbon Footprint certification for the 2019/2020 financial year and has been issued certificate number 61000011.

2 Background

This report is the first externally assessed annual greenhouse gas (GHG) emissions inventory, prepared for South Taranaki District Council in accordance with the requirements of ISO 14064-1 (2018) and covers the period 1 July 2019 – 30 June 2020.

2.1 Communication and dissemination

This inventory was prepared as a management tool for South Taranaki District Council to:

- Assist it in managing its response to climate change and its reduction of GHG emissions.
- Be a communication tool that demonstrates to ratepayers, community members, employees and stakeholders that South Taranaki District Council has identified its emissions profile, is aware of the significant issues related to climate change and is taking action to mitigate these issues, including offsetting unavoidable emissions.

The users of this report will include, but are not limited to staff, managers and South Taranaki District Council Councillors. The summary of this inventory will be made available to the public on request. A copy of the summary report will also be available from Ekos' website.

2.2 Reporting period and base year

This inventory is for the reporting period 2019/20 financial year. As its first externally assessed measurement, this will also be the base year for South Taranaki District Council. In subsequent inventories, comparisons will be made to this base year.

2.3 Verification and Compliance with Standard

This inventory has been prepared in compliance with the International Standards Organisation's process for calculating and reporting GHG emissions 14064-1 (2018). This measurement was externally reviewed by Catalyst Ltd as meeting the ISO 14064-1 standard for measurement. However, it should be noted that this measurement is an unverified inventory and that no verification audit has been conducted of the findings.

As per the Ekos programme instruction rules, which state that inventories in excess of 1000 tCO_2e undergo a verification audit every four years, South Taranaki District Council will be required to undergo a verification in the fourth year of their measurement (2024) and every four years after that.

3 Organisational Boundary

The organisational boundary identifies which facilities or subsidiaries of South Taranaki District Council are included or excluded from the carbon inventory. Emissions from all aspects of the organisation are consolidated to determine the total volume. Consolidation is done using one of these methods:

- Control, whereby all emissions over which the organisation has either *financial* or *operational* control are included in the inventory
- Equity share, whereby the organisation only includes emissions for the portion of the facilities and business that the organisation owns.

For South Taranaki District Council inventory, the consolidation method of operational control has been used to consolidate emissions. This means that all emissions over which South Taranaki District Council has operational control have been included in the inventory.

Included within South Taranaki District Council's organisational boundary are therefore all emission sources that occur within South Taranaki District Council headquarters and satellite offices as well as the community facilities that the council owns and operates across the District.

Excluded from the organisational boundary are the following contracted services: waste management services; landfill operations occurring in neighbouring local authority districts; water and waste water emissions (it is planned to include emissions from waste water in the 2020/2021 inventory); road maintenance and construction services; after hours regulatory services.

4 Reporting Boundary

The reporting boundary identifies which emission sources are included in the carbon inventory and which are excluded. ISO 14064-1(2018) categorises emissions as follows:

- Direct emissions (scope 1) are those resulting directly from the organisation's operations including stationary energy sources and vehicles owned by the company.
- Indirect emissions (scope 2 and 3) emissions are indirectly created by the company through the importation of electricity, heat or steam generated elsewhere or from the organisation's purchase of goods and services (such as business travel and the production of waste) that cause emissions to be generated by others.

In compliance with the ISO Standard, South Taranaki District Council is measuring all relevant direct and indirect emissions in this GHG inventory.

The included emission sources are shown in Figure 1 below:

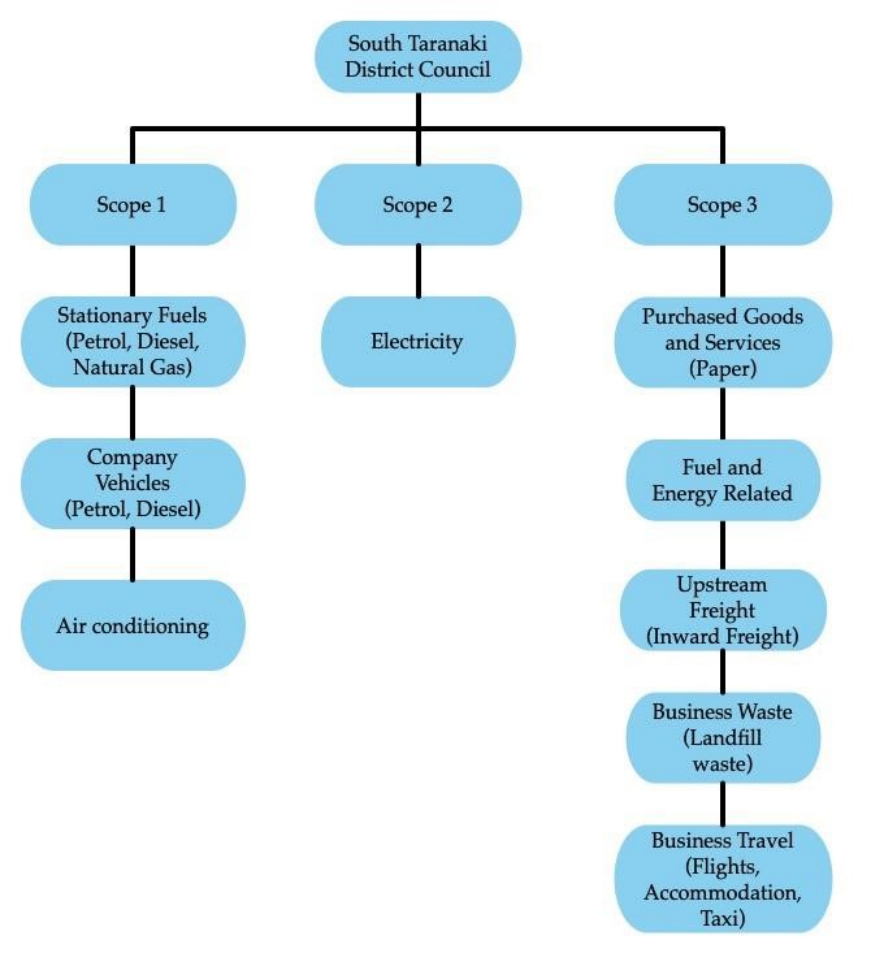


Figure 1: Emission sources for South Taranaki District Council

The following emission sources were excluded from South Taranaki District Council carbon footprint inventory for the 2020 calendar year:

- Purchased goods and services:
  Water and data storage were excluded due to lack of data. It is planned to include these in the 2021 financial year inventory
- Capital Goods:
  Excluded due to the unreliability of emission factors for capital goods
- Upstream Freight:
  Outward freight only as it was estimated to be de-minimis
- Business waste:
  Wastewater of the council operations was excluded as it was estimated as being de-minimis
- Employee commute:
  Data was not available and this year but it is intended to collect this in the 2020/21 financial year inventory

5 Greenhouse Gas (GHG) Inventory

5.1 Methodology

This GHG inventory was prepared in compliance with the international Standards for calculating GHG emissions. These Standards are the World Resource Institute's "Greenhouse gas protocol, a corporate accounting and reporting standard (GHG protocol) and "ISO 14064-1 (2018) Specification with guidance at the organisation level for quantification and reporting of GHG emissions and removals" (ISO 145064-1 (2018)). In measuring this inventory, the five principles of ISO 14064-1 (2018) were strictly applied.

The methodology used in measuring South Taranaki District Council organisational GHG inventory is illustrated in the following diagram:

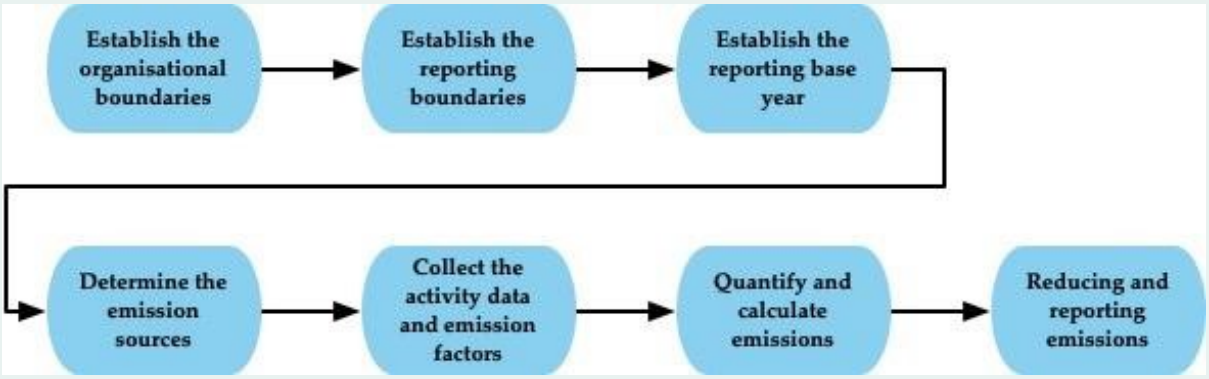


Figure 2: ISO 14064-1 (2018) methodology for measuring a GHG inventory

5.2 Data Collection

Data was collected by South Taranaki District Council staff with guidance where required from Ekos. The table below provides an overview of the data collected for each emission source. All emissions were calculated using an Ekos-developed calculator. The calculation method used to quantify South Taranaki District Council GHG emissions inventory was the activity data multiplied by the appropriate emission factor:

Tonnes CO_2e = Total GHG activity x appropriate emission factor

Activity data for South Taranaki District Council was obtained from a range of sources, which are outlined in the table below.

GHG emission factors were generally sourced from New Zealand's Ministry for the Environment. Where appropriate emission factors were not available, other reliable sources such as international government agencies or published research were used. A full list of the emission factors used is provided in Appendix 1.

Table 1: *Data sources for South Taranaki District Council emissions*

Emission Source		Unit	Data Source
Stationary Fuels		Litres of fuel	Supplier invoices and Ebench
Company Vehicles		Litres of fuel	Financial team (invoices)
Air conditioning (refrigerants)		Kg	Supplier invoices
Electricity		Kwh	Invoices and Ebench
Purchased Goods and Service (paper)		Tonnes of paper	Supplier reports
Fuel and energy related emissions	Transmission and Distribution Losses	Kwh	Invoices and Ebench
	Production and Distribution of Fuel	Litres of petrol Km or Passenger km	Supplier invoices or internal record keeping
Upstream Freight (inward)		T CO_2e	Supplier reports
Business Waste - Landfill Waste		Litres and kgs	Supplier invoices
Business Travel	Taxi Travel	Km travelled	Internal record keeping
	Air Travel	Passenger km	Supplier reports
	Accommodation	Nights in accommodation	Internal record keeping

5.3 South Taranaki District Council GHG Profile

South Taranaki District Council's total emissions for the 12-month period from 1st July 2019 – 30th June 2020, were 1,216.23 tonnes of CO_2e.

5.3. 1 South Taranaki District Council emissions by scope

The majority (46%) of South Taranaki District Council emissions are from Scope 1 activities (mostly stationary fuels), this is followed by Scope 2 (37%) electricity. The remaining emissions come from scope 3 (16%) which mostly comes from fuel and energy related emissions. Figure 3 and Table 2 below show these emission distributions in more detail.

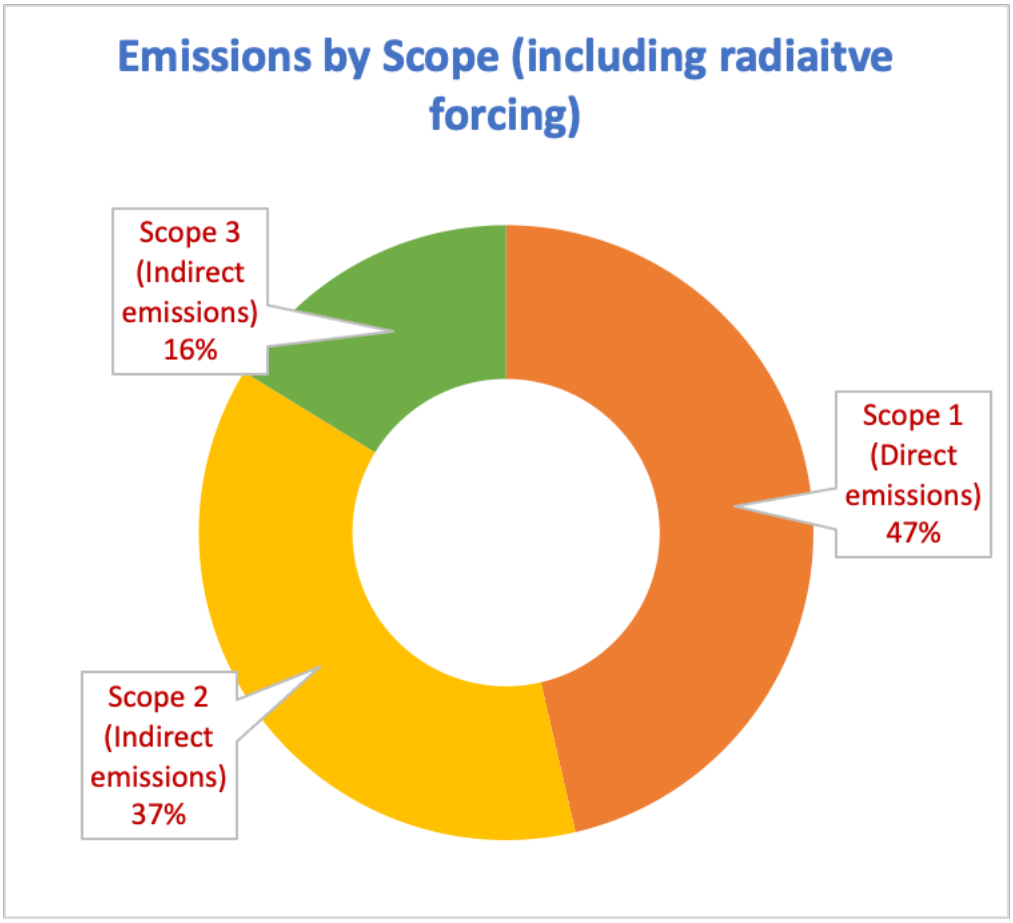


Figure 3: Emissions by scope South Taranaki District Council 2020

Table 2: Emissions by scope South Taranaki District Council 2020

Scope	**Tonnes of CO_2e**	**% of total**
Scope 1	564.03	46%
Scope 2	454.56	37%
Scope 3	197.64	16%
Total	**1,216.23**	

5.3.2 South Taranaki District Council scope one emissions by gas type

ISO 14064-1 requires that Scope 1 emissions are reported separately by gas type with Table 3 below showing these separated emissions for each Scope 1 emissions source. The vast majority of this is carbon dioxide.

Table 3 South Taranaki District Council scope 1 emissions by gas type

Emission Source		**Tonnes of Carbon Dioxide Equivalent (CO2e)**	**Tonnes of Carbon Dioxide (CO_2)**	**Tonnes of Methane (CH_4)**	**Tonnes of Nitrous Oxide (N_2O)**	**Tonnes of Hydrofluoro carbons (HFC)**	**Tonnes of Perofluoro Carbons (PFC)**	**Tonnes of Sulpur Hexaflouride (SF_6)**
Fugitive	Various	4.18	0.00	0.00	0.00	4.18	0.00	0.00
	Sub Total	*4.18*	*0.00*	*0.00*	*0.00*	*4.18*	*0.00*	*0.00*
Company Vehicles	Petrol	40.04	38.28	0.16	1.30	0.00	0.00	0.00
	Diesel	123.01	120.93	0.16	1.93	0.00	0.00	0.00
	Sub Total	*163.05*	*159.21*	*3.23*	*0.61*	*0.00*	*0.00*	*0.00*
Stationary Fuel	Petrol	2.53	2.41	0.03	0.08	0.00	0.00	0.00
	Diesel	5.26	5.23	0.02	0.01	0.00	0.00	0.00
	Natural Gas	389.02	388.02	0.81	0.19	0.00	0.00	0.00
	Sub Total	*396.81*	*395.67*	*0.86*	*0.29*	*0.00*	*0.00*	*0.00*
	Total	**564.03**	**554.87**	**1.47**	**3.52**	**4.18**	**0.00**	**0.00**

5.3.3 South Taranaki District Council emissions by activity

Figure 4 and Table 4 below show the breakdown of emissions by activity for South Taranaki District Council. The majority of emissions are from electricity (37%), followed by stationary fuel (33%), company vehicles, and fuel and energy related emissions (both on 13%). Fugitive emissions, purchased goods and services, upstream freight, business waste and business travel accounted for the remaining 4% of emissions.

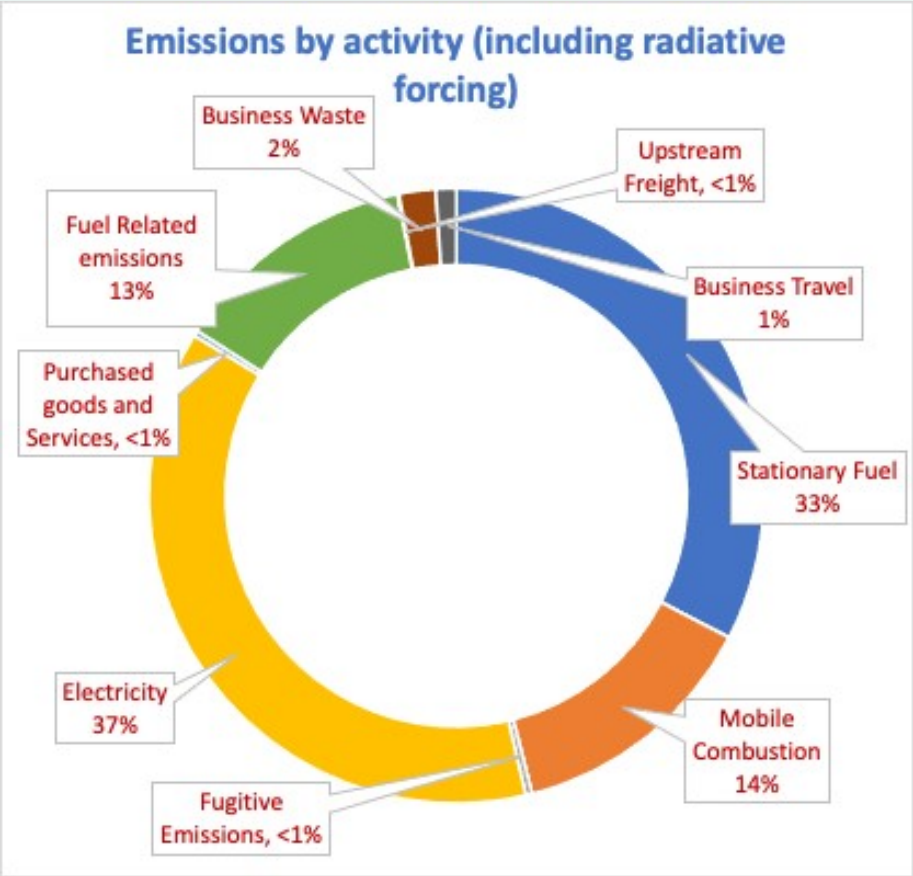


Figure 4: Emissions by activity South Taranaki District Council 2020
Table 4: Emissions by activity South Taranaki District Council 2020

Scope of emissions	Activity	tCO2e	% of total emissions
Scope 1	Stationary fuel	396.81	33%
	Company Vehicles	163.05	13%
	Fugitive Emissions	4.18	<1%
	Total Scope 1 emissions	**564.03**	**46%**
Scope 2	Electricity	454.56	37%
	Total Scope 2 emissions	**454.56**	**37%**
Scope 3	Purchased Goods and Services	3.39	0.28%
	Capital Goods	0.00	Exclusion
	Fuel and Energy Related emissions	156.91	13%
	Upstream Freight	1	<1%
	Business Waste	23.37	2%
	Business Travel	12.98	1%
	Employee Commute	0.00	Exclusion
	Upstream Leased Assets	0.00	NA
	Downstream Transport	0.00	NA
	Processing of Sold Goods	0.00	NA
	Use of Sold Goods	0.00	NA
	End of life Treatment of Sold Goods	0.00	NA
	Downstream Leased Assets	0.00	NA
	Franchises	0.00	NA
	Investments	0.00	NA
	Total Scope 3 emissions	**197.64**	**16%**
Total		**1,216.23**	

5.4 Uncertainty and Data Quality

Where accurate data is not available, it is appropriate to estimate to ensure that a comprehensive inventory measurement is completed. Estimates must be carried on a scientifically-derived basis to ensure accuracy. For South Taranaki District Council's GHG inventory, there are the following areas of uncertainty:

- Stationary Fuel (petrol)
  Petrol for machinery such as lawn mowers is purchased with a fuel card but the card does not report in litres of fuel only on dollar spend. To improve the data quality it would be necessary to see of the litres could be provided.
- Air Conditioning
  This was an estimate based on previous year's top-ups. For a more accurate measure, the contractor who services the air conditioning units could be contacted and asked to provide annual reports of top-ups undertaken.
- Upstream Freight
  While the majority of emissions are captured through the inclusion of Office Max purchases, there is other freight that is not recorded as it is too hard to obtain the data. To improve this it would be necessary for South Taranaki District Council to record this as it arrived.
- Business Waste
  Waste was estimated and it was assumed that all bins were full when collected, however not all bins will have been full. To improve data quality it will be necessary to either weight material or to monitor how full bins were as they are emptied.
- Business travel – taxis
  Taxi data comes from taxi booking information from council support services, this was generally excellent work, there were however the odd gaps in kilometres travelled as reported by staff using taxis. To improve the quality of this data employees using taxis could be reminded of the need for recording this data.

To increase the quality of the carbon inventory, South Taranaki District Council should plan to improve data collections processes for the above, as appropriate. These improvements should start as soon as possible.

6 Offsets and Certification

South Taranaki District Council has elected not to offset their emissions this year. Therefore, South Taranaki District Council has qualified for Carbon Footprint Certification for the 2020 financial year.

7 Reductions

Ekos recommends the South Taranaki District Council take action to reduce its operational carbon emissions. These recommendations are based on South Taranaki District Council emissions hotspots. These are the highest level emissions sources, and provide the greatest opportunity to reduce emissions for South Taranaki District Council at the lowest cost.

The highest emission sources for South Taranaki District Council are:

- Scope 2 Electricity emissions
- Scope 1 Stationary Fuel Emissions

The recommended reductions are as follows:

- Electricity
  As a first step, consider conducting an electricity audit of your different facilities to understand what the main uses of electricity are. This will also provide insights into methods to manage and reduce electricity usage, and therefore areas where possible reductions can be made. When it comes to electricity usage, greater energy efficiency targets are the place to start.

  If you are not generating your own solar power, the next best thing is to switch to providers that are using renewable power that is carbon neutral certified. An example of such a provider is Ecotricity.

  Investigating whether solar is an appropriate and beneficial option for South Taranaki District Council is another good option. There is a range of solar providers who can advise on the best infrastructure solution for South Taranaki District Council, and if it is decided to invest in an electric fleet, with on-site charging, solar will also help reduce these associated costs.

- Stationary Fuel Emissions
  If it is not possible to avoid the use of infrastructure that is reliant on fossil fuels, the best action to take is to improve the efficiency of this infrastructure. Consider where optimisations or simplifications can be made. The good news is that efficiency gains in fuel usage will often translate into cost savings as well as emission reductions!

  If it is affordable, upgrade fossil fuelled infrastructure to infrastructure that is powered by renewables or low carbon fuels. If this is not possible then ensure that stationary combustion engines are serviced regularly to maintain efficiency.

  Implement an internal policy that upon renewal, first consideration is given to replacing fossil fuel reliant infrastructure with infrastructure that is powered by renewables (in circumstances where such technology exists). Where technology does not exist, then adopt a policy that new infrastructure investments will be made to purchase the most efficient version of the product.

8 Glossary

De minimis

Certain activities contribute less than 1 percent of the total of CO_2e emissions. These may be excluded from the GHG inventory, provided that the total of excluded emissions does not exceed a materiality threshold of 5 percent. That is, the total of all excluded emission sources should not exceed 5 percent of the total inventory.

Greenhouse gas (GHG)

Gaseous constituent of the atmosphere, both natural and anthropogenic, that absorbs and emits radiation at specific wavelengths within the spectrum of infrared radiation emitted by the Earth' surface, the atmosphere and clouds. These include:

- Carbon dioxide (CO_2)
- Methane (MH_4)
- Nitrous oxide (N_2O)
- Hydrofluorocarbons (HFCs)
- Perfluorocarbons (PFCs)
- Sulphur hexafluoride (SF_6)

GHG Scopes

- Scope 1: Direct emissions from sources owned or controlled by reporting entity. For example diesel generator, coal heating, own vehicle fleet, agriculture
- Scope 2: Indirect emissions generated by purchased energy. For example, electricity, gas.
- Scope 3: Indirect emissions that are a consequence of activities undertaken by the reporting organisation or related individual, but not directly controlled by the organisation. For example, flights, freight, non-company vehicles, waste, electricity line distribution and transmission losses.

Radiative Forcing (RF)

Radiative forcing helps organisations account for the wider climate effects of aviation, including water vapour and indirect GHGs. This is an area of active research, which seeks to express the relationship between emissions and climate warming effects of aviation.

Inclusion of radiative forcing effects is optional for Ekos' clients as the science is still evolving.

Ekos uses a multiplier of 1.9 to account for radiative forcing effects in line with the Ministry for the Environment publication Measuring Emissions: A Guide for Organisations 2019.

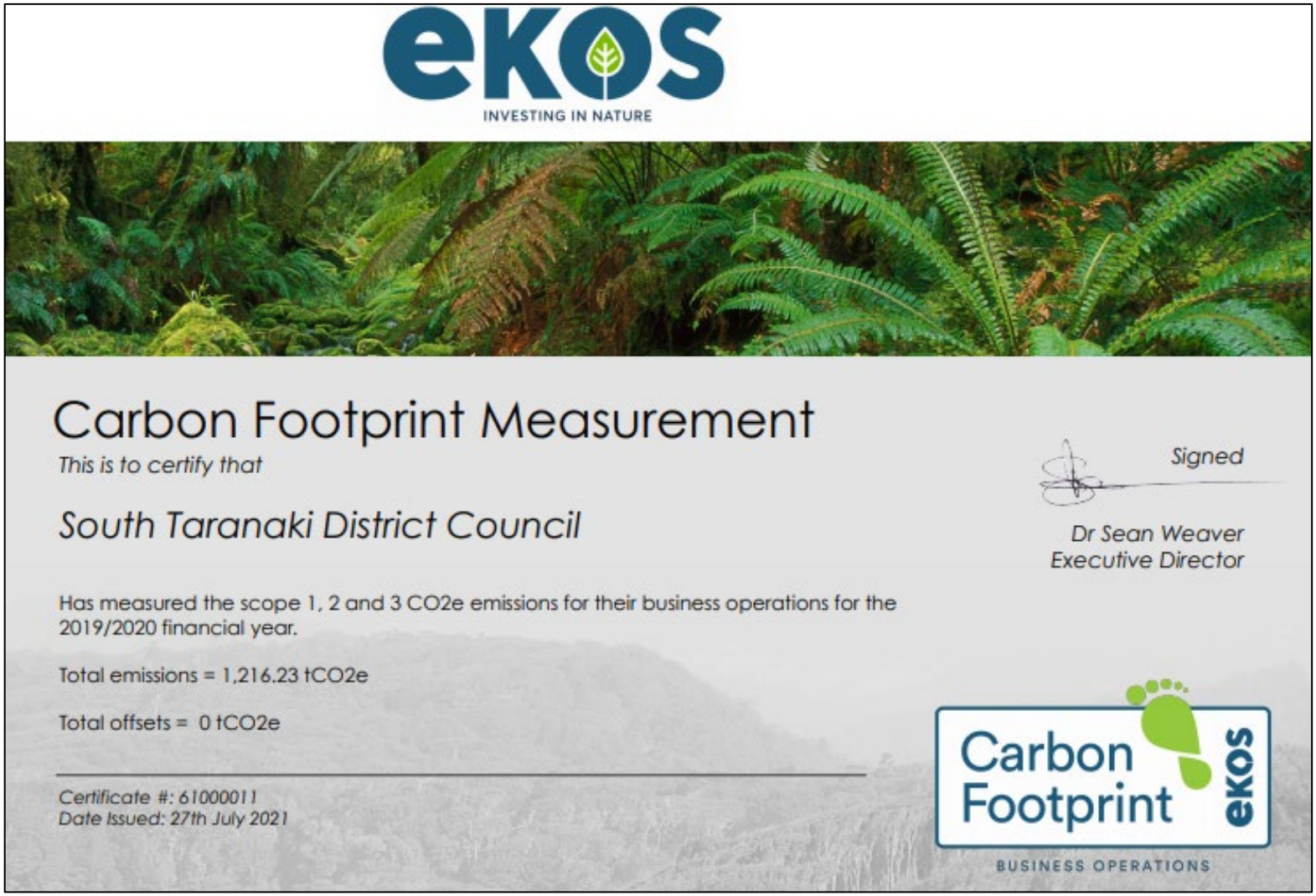
Appendix 1: Emission Factors

Ekos uses emission factors provided by the New Zealand Ministry for the Environment (MfE) publication Measuring Emissions: A Guide for Organisations 2019. Where emission sources are not covered by the MfE publication, Ekos identifies suitable factors for use from the Department for Environment, Food and Rural Affairs (DEFRA), UK Government document Factors for Greenhouse Gas Reporting 2018. A full list of the emission factors used in this report are shown below:

Emission Source	Activity	Emissions Factor	Emissions Factor Source
Stationary Fuels	Petrol	0.002451/litre	Ministry for the Environment
	Diesel	0.002663/litre	Ministry for the Environment
	Natural Gas	0.000194/kwh	Ministry for the Environment
Company Vehicles	Petrol	0.002452/litre	Ministry for the Environment
	Diesel	0.002694/litre	Ministry for the Environment
Air conditioning (refrigerants)	Hydro Fluro Carbon 410A	2.09/kg gas	Ministry for the Environment
Electricity		0.000101/kwh	Ministry for the Environment
Purchased Goods and Service	Paper	0.952/tonne of paper	Department of Environment, Food and Rural Affairs
Fuel and energy related emissions	Transmission and Distribution Losses (Electricity)	0.00000087/kwh	Ministry for the Environment
	Transmission and Distribution Losses (Natural Gas)	0.000012/kwh	Ministry for the Environment
	Production and Distribution of Fuel (Diesel)	0.00062611/litre	Department of Environment, Food and Rural Affairs
	Production and Distribution of Fuel (Petrol)	0.00059732/litre	

	Production and Distribution of Fuel (Land freight - van)	0.0001994/tonne km	
	Production and Distribution of Fuel (domestic flights)	0.000027/passenger km	
Upstream Freight	Inward	0.000105/tonne km (truck)	Ministry for the Environment
Business Waste	Landfill Waste (with landfill gas recovery)	0.0000404/kg	Ministry for the Environment
		0.000311/litre	Ministry for the Environment
Business Travel	Taxi Travel	0.000225/km	Ministry for the Environment
	Air Travel (NZ Domestic, including radiative forcing)	0.000242/passenger km	Ministry for the Environment
	Accommodation (New Zealand)	0.01280/room/night	Ministry for the Environment

Appendix 7: EKOS Ltd Carbon Inventory Certificate



Appendix 8: Glossary

Climate change: The phenomenon of climate patterns deviating from their usual natural changes (temperature, frequency, intensity of weather events). In a modern context, climate change commonly describes how average global seasonal weather and temperature patterns, and their extremes, will change from their current state because of the global warming of the Earth, caused by the emission of greenhouse gases from human activities.

CCC: Acronym for Climate Change Commission

CFC: Acronym for Chlorofluorocarbon.

CH_4: Chemical symbol for methane, a greenhouse gas.

Chlorofluorocarbon:[21] Any of several simple gaseous compounds that contain carbon, chlorine, fluorine, and sometimes hydrogen, that are used as refrigerants, cleaning solvents, and aerosol propellants and in the manufacture of plastic foams, and that are believed to be a major cause of stratospheric ozone depletion. Acronym: CFC.

CO_2: Chemical symbol for carbon dioxide, a greenhouse gas.

CO_2-e: Chemical symbol for carbon dioxide equivalent. Carbon dioxide equivalent is a measure used to compare the emissions from various greenhouse gases based upon their global warming potential. For example, the global warming potential for methane over 100 years is 25. This means that emissions of one million metric tons of methane is equivalent to emissions of 25 million metric tons of carbon dioxide.

Deforestation: The clearing of forested land that is not subsequently replanted and is permanently converted to a non-forest land use.

EECA: Energy Efficiency and Conservation Authority

Emission: The production and discharge of gas into the atmosphere.

ESF: Acronym for Energy and Sustainability Forum, an STDC staff working group focused on energy efficiency.

ETS: Acronym for New Zealand Emissions Trading Scheme.

F-gases: Acronym for Fluorinated gases, which are a set of very strong human-made greenhouse gases used in products such as refrigerators and air conditioners

GHG: Acronym for greenhouse gas.

GHG Inventory: A report including the numerical figures of greenhouse gasses and details on emission sources from a given source activity or organisation.

[21] Merriam-Webster, 2019: https://www.merriam-webster.com/dictionary/chlorofluorocarbon

GHG Protocol: A defined protocol that sets standards for the methods of greenhouse gas emissions reporting, and which allows for consistency and comparability of emissions across diverse activities and organisations.

Global warming: The increase in the average atmospheric temperature across our planet over time.

Global Warming Potential: The global warming potential of a gas is measure of its total contribution to global warming over its lifetime. More specifically, it measures the warming impact from the emission of one unit of a certain gas when compared to one unit of carbon dioxide. Carbon dioxide is the reference gas and is thus assigned a value of 1. Acronym: GWP.

Greenhouse gas: Any gaseous compound (such as carbon dioxide and methane) that absorb infrared radiation from the sun, causing the heat to be trapped in the Earth's atmosphere, creating a greenhouse effect for the entire planet. Abbreviation: GHG.

GWP: Acronym for Global Warming Potential.

HFC: Acronym for hydrofluorocarbon.

Hydrofluorocarbon:[22] Any of several organic compounds composed of hydrogen, fluorine, and carbon. Hydrofluorocarbons are produced synthetically and are used primarily as refrigerants. They became widely used for this purpose beginning in the late 1980s, with the introduction of the Montreal Protocol, which phased out the use of chemicals such as halons and chlorofluorocarbons (CFCs) that contribute to the depletion of Earth's ozone layer. However, while HFCs have an ozone depletion potential of zero, they are potent greenhouse gases, and thus their manufacture and use is becoming increasingly regulated in the 21st century. Acronym: *HFC*.

ISO: Acronym for International Organisation for Standardisation

Kyoto Protocol:[23] The Kyoto Protocol is an international agreement linked to the United Nations Framework Convention on Climate Change, which commits its Parties, including New Zealand, by setting internationally binding greenhouse gas emission reduction targets.

LULUCF: Acronym for the Land-Use, Land-Use Change and Forestry Sectors in New Zealand.

MFE: Acronym for Ministry of the Environment

Montreal Protocol:[24] The Montreal Protocol on Substances that Deplete the Ozone Layer is a global agreement to protect the Earth's ozone layer by phasing out the chemicals that deplete it. This phase-out plan includes both the production and consumption of ozone-depleting substances. The landmark agreement was signed in 1987 and entered into force in 1989.

NO_2: Chemical symbol for nitrous oxide, a greenhouse gas.

[22] Encyclopaedia Britannica, 2019: https://www.britannica.com/science/hydrofluorocarbon
[23] UNFCCC, 2019: https://unfccc.int/kyoto_protocol
[24] UN, 2019: https://ozone.unep.org/treaties/montreal-protocol

New Zealand Emissions Trading Scheme (NZETS): The New Zealand Emissions Trading Scheme is the Government's main tool for meeting international and domestic climate change targets. The scheme aims to encourage people to reduce greenhouse gas emissions.

New Zealand Units (NZUs): Under the New Zealand Emissions Trading Scheme, one emission unit, the New Zealand Unit, represents one metric tonne of carbon dioxide or carbon dioxide equivalent (ie.the amount of another greenhouse gas that does as much damage as one tonne of carbon dioxide).

Paris Agreement: An agreement within the United Nations Framework Convention on Climate Change. The Paris Agreement builds upon the Convention and for the first time brings all nations into a common cause to undertake ambitious efforts to combat climate change and adapt to its effects, with enhanced support to assist developing countries to do so. As such, it charts a new course in the global climate effort.

Refrigerants: A substance used in appliances for cooling.

Scope: A category for gaseous emissions designed to assist with the collection of data and to remove the risk of double counting across an activity or organisation.

STDC: Acronym for South Taranaki District Council.

UNDP: Acronym for United Nations Development Programme.

UNFCCC: Acronym for United Nations Framework Convention on Climate Change.

WWTP: Acronym for wastewater treatment plan.