New Plymouth District Council Corporate Carbon Footprint

2021/2022

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Client: New Plymouth District Council

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			Name/Position	Signature
1	1 June 2023	Issued for Review	Dustin Courage NPDC Climate Change Mitigation Advisor	
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4	Sept 15, 2023	Post Audit Comments	Dustin Courage NPDC Climate Change Mitigation Advisor	
5	Sept 20, 2023	Audit Calculation Issues Identified and resolved.	Dustin Courage NPDC Climate Change Mitigation Advisor	
6	Sept 22, 2023	ISO categories – Community Waste as Cat. 6.	Dustin Courage NPDC Climate Change Mitigation Advisor	
7	Sept 25, 2023	Audit comments addressed	Dustin Courage NPDC Climate Change Mitigation Advisor	
8	Sept 27	Audit Section 3.1 updated	Dustin Courage NPDC Climate Change Mitigation Advisor	

1.0 Introduction

In Jan 2023, New Plymouth District Council (NPDC) Climate Action Team, decided to update its organisation Greenhouse Gas (GHG) inventory for the 2021/2022 financial year. One previous GHG inventory was produced in 2021 by AECOM for the 2017/ 2018 financial year; it was not third party verified. This report outlines the methodology for undertaking the assessment (section 2.0) and provides the results (section 3.0).

This second revision of NPDCs corporate carbon footprint has been triggered by material changes in NPDC's operations and emissions sources and sinks. This GHG inventory is a calculated estimate of all GHGs emitted as a result of activities under the control of NPDC for financial year 21/22, between 1st July 2021 and 30th June 2022.

This 21/22 Inventory will form the baseline for subsequent GHG reporting and will allow the NPDC to report on the effectiveness of its organisational emissions reduction plan produced in 2022 by WSP (ECM 8726026).

This inventory excludes the emissions from three Council-Controlled Organisations (CCOs): Venture Taranaki; Papa Rererangi i Puketapu Ltd (PRIP) (New Plymouth District Airport, hereafter referred to as NPDC Airport), and; New Plymouth PIF Guardians Ltd. For the purpose of this inventory, NPDC is deemed not to have operational control of its CCOs.[1]

[1] Overall control of Operations sits with CCO's Board of Directors. NPDC is the 100% shareholder

1.1 Inventory Purpose

The objectives of this corporate carbon footprint are to:

- Provide information to the Council on their overall organisation GHG emissions for which they have operational control.
- Highlight key emission sources for future management
- Provide a standard methodology for use in future years
- Develop an improved system of carbon accounting within the organisation
- Establish a baseline for the inventory that is third party verified
- Establish emissions reduction targets
- Demonstrate to key stakeholders that NPDC is actively involved in monitoring and managing its GHG emissions.

1.2 Statement of Intent

This inventory is prepared as a management tool for NPDC to:

- Assist NPDC in managing its GHG emissions and complying with its Emissions Reduction Plan and achieving its Emissions Reduction Targets.
- Act as a communication tool for all interested parties and stakeholders that NPDC has identified its emissions profile and is taking action to mitigate emissions. The majority of NPDC rate payers demand NPDC to take more action in Climate Change and there is an expectation of integrity and transparency with respect to GHG emissions.
- Intended users, Stakeholders and interested parties include NPDC Management, Executive Leadership Team, Community members, IWI / Hapu and other community groups. Other interested parties are external suppliers, central government and regulatory bodies.

Figure 1: New Plymouth District Council location

2.0 Methodology & Baseyear

This section covers the methodology and approach to developing this corporate carbon footprint, including boundary definition and exclusions, emission factors, activity data and assumptions and limitations.

The assessment follows the guidelines in the Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard, 2004 (GHG Protocol); and the Corporate Value Chain (Scope 3) Accounting and Reporting Standard, 2011.

In calculating this footprint, an operational control rather than an investment or economic approach. This approach has been taken to minimise uncertainty and produce accurate, consistent and reproducible results. This methodology is also based on Greenhouse gases-Part 1: Specification with guidance at the organization level for quantification and reporting of greenhouse gas emissions and removals (ISO standard 14064-1:2018).

2.1 Organization Boundary / Consolidation Approach

The organisational boundary identifies which facilities or subsidiaries of NPDC are included or excluded from the carbon inventory. Emissions from all aspects of the organisation are consolidated to determine the total. 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 NPDCs inventory the operational control method has been used to consolidate emissions. This means that all emissions over which NPDC has operational control will be included.

2.1.1 Organisation Boundary- Operational Control

Figure 2 and Table 1 below illustrates the organisation boundaries as defined in this report. The key business unit of each group or activity is also provided below. For the purpose of this inventory NPDC is deemed to not have control of the operations of any of the CCOs (Council Controlled Operations) that are included in table 1 below: Venture Taranaki and Papa Rererangi i Puketapu Ltd (PRIP) (New Plymouth Airport), PIF Guardians and Forestry JV.

NPDC does not have the day-to-day ability to direct activities of a CCO as the two main levers – appointment of directors and the statement of intent process – do not provide either the ability to direct policies or the full authority to introduce and implement operating policies. Council does have reserve powers to require a CCO Board to modify its statement of intent. A statement of intent is, however, relatively high-level of the activities and intentions.

Table 1; NPDC's CCO Functions

CCO	Function
Venture Taranaki	Partially funded by NPDC, Venture Taranaki (VT) are the regional economic development agency. The agency offers professional services. VT has its own independent board of directors and CEO. VT has its own GHG inventory by Toitu.
PIF Guardians	The New Plymouth PIF Guardians Limited was set up in 2017 and is a council-controlled organisation. Since 2017, the PIF has been managed at arm's length by independent investment firm Mercer. Release payments / annual revenue from PIF are used to offset rates and keep rate rises minimised. The New Plymouth District Council (Perpetual Investment Fund) Act 2023 sets out requirements for investment decisions for the PIF to be made independently of elected members. NPDC does not have operational control of PIF Guardians or Mercer.
Papa Rererangi i Puketapu Ltd (PRIP)	New Plymouth Airport services the regional flights. PRIP has its own independent board of directors and CEO. PRIP has its own GHG inventory and is apart of the international Airport Carbon Accreditation Programme.
Forestry JV	NPDC and Multiple Land Owners. The JV's set out that the landowners provide the land and the Council plants the trees and undertakes the silviculture (pruning) of the trees. When they are harvested, the profits are split between the landowner and council. The landowner's return is a form of rental for the land, and the council gets back money to reflect that spent growing the forest. NPDC has already used and cancelled its Carbon credits from its pre 1990 Forests.

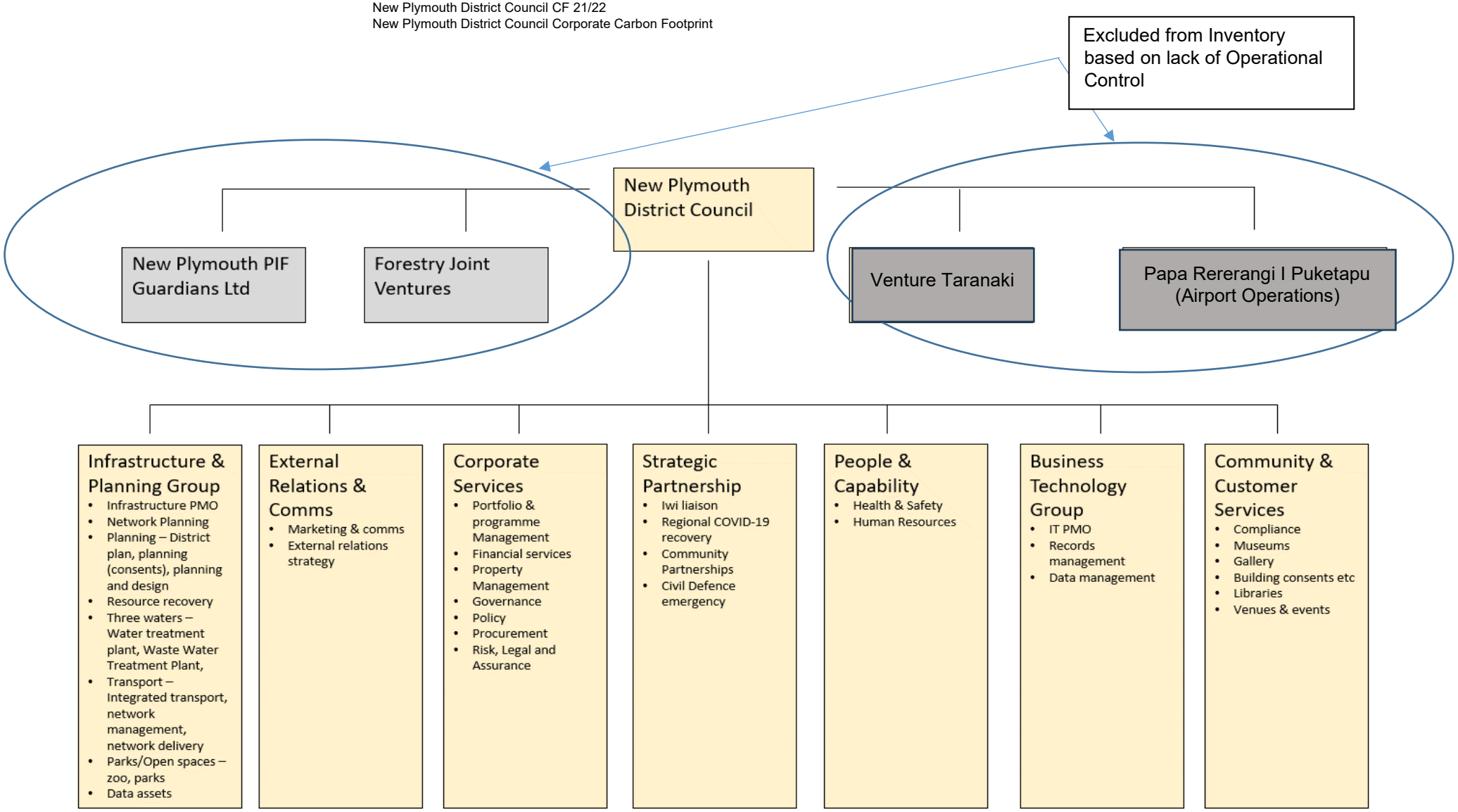

Figure 2:New Plymouth District Council activities and organisations included in the organisation boundary by scope

2.1.2 Operational Boundary Exclusions

An operational boundary defines the scope of direct and indirect emissions for operations that fall within a company's established organisation boundary. Potential emission sources and sinks and their inclusion in the project boundary were decided by the Energy and Emissions Advisor in collaboration with the respective NPDC leaders. To determine the materiality of the various emission sources and their inclusion in the boundary, several factors were considered. These included the size of emissions, stakeholder interest, and potential reduction opportunities, as well as the ability of stakeholders to measure emissions.[2]

An effort has been made to include as many emissions sources as possible within NPDCs operational boundary. However, not all emissions sources were able to be captured. Table 2 summarises why some emission sources were excluded from the operational corporate carbon footprint.

Table 2; Emission sources and sinks excluded from NPDC footprint

Potential emission source	Reason for Exclusion
Scope 1	
Direct removals from land use, land use change and forestry sinks	Carbon Credits for their pre -1990 forest land have been claimed previous to this inventory
Combustion of Biomass and Biofuel is not happening within NPDC boundary.	Not happening within the operational boundary.
Scope 3	
CCOs PIF investments	Not within Operational Control of NPDC Airport and Venture Taranaki (VT) have their own GHG inventories and emissions reduction programmes.
Other Scope 3	
• Downstream transportation and distribution (Category 9) • Processing of sold products (Category 10) • Use of sold products (Category 11) • End-of-life treatment of sold products (Category 12) • Franchises (Category 14)	Cat. 9 – freight is included within the purchase price and emissions factors used for purchased goods and services. Cat. 10, 11, 12: Use of Bioboost Fertiliser made from Wastewater sludge has been excluded from the assessment. It is uncertain if the use of Bioboost would save end user GHG emissions. Cat. 14 – Not applicable

2.1.3 Base year recalculation policy

Base year data may need to be revised when material changes occur and have an impact on calculated emissions. NPDC have aligned with common industry practice. When the changes are estimated to represent more than 5% of Scope 1, 2 or 3 emissions, or when there are significant changes to the organisational or reporting boundaries or calculation methodology, a recalculation of base year data will be completed with explanation.

[2] Please refer to the NPDC Org Inventory Results 2021-2022 excel workbook for further details.

2.2 Inventory Emission Sources, Emission Factors and Activity Data

This section describes the activities covered within each scope. It provides a brief description on each activity, referencing the source of both the activity data and the relevant emission factor. It also provides a rating of the data quality based on previously used data quality assessment (see Appendix B - Data Quality for details). Emission factors all include the six direct Kyoto gases (CO_2, CH_4, N_2O, HFCs, PFCs and SF_6) in accordance with requirements under the GHG Protocol.

Emission factors are derived from a range of sources, principally those provided in MfE (2023) and Auckland City Council Capital Carbon Emissions assessment (2023).

2.2.1 Scope 1 Direct Emissions Stationary Combustion (natural gas, diesel, petrol, refrigerants, and LPG)

Natural gas is consumed at 22 of NPDC's operated locations, including wastewater treatment plants, pools, museums and libraries, stadiums and events, property and parks and reserves. It is predominantly used for heating of the main facilities including Civic Center, Len Lye, Puki Ariki, Todd Energy Aquatic Center and other pools. The largest user of fossil gas is the Waste Water Treatment plants Thermal Drying Facility (TDF) consuming ~ 65%.

NPDC have been operating an energy management software since 2016 which records historical trends. The energy management software was previously E-Bench and has recently been shifted to ESP Utility Hub. Data accuracy is high (M1).

Crematorium:

NPDC owns and operates two cremation furnaces. The 2021/22 inventory has the old model of furnaces that was used and they used approximately 34,862 kg of LPG. One furnace has been replaced in 2022 with a new furnace that is 30% more efficient. The second furnace is being replaced in 2025 with a similar furnace, both of which operate at 2.3v GJ/hr.

Refrigerants:

This covers the leakage of refrigerant gases used in both domestic-sized refrigerators and heating, ventilation, and air-conditioning (HVAC) systems used by Council operated entities.

Actual quantities of leaked gases were not measured due to a lack of reliable data. Leakage rates (per equipment type) were estimates based on average leakage rates provided by MfE (2023).

As leakage rates are only estimates, the quality of the data is of a lower quality (D1).

Mobile Combustion:

Fleet NPDC's fleet consists of petrol and diesel vehicles. During the inventory period, NPDC fleet vehicles ran on either diesel or unleaded petrol. Fuel consumption data has been provided by NPDC. Emission factors were taken from MfE (2023). The activity data is of a high quality (M1). Rental car use for business travel was included under Scope 3 and data was provided directly by the finance team. Emission factors were taken from MfE (2023).

Waste – Landfills:

NPDC has operational control over multiple closed landfills.

Old historic landfills are Okato, Inglewood, Okoki Road, Oakura, Waitara, Marfell Park, Waiwhakaiho, Tongaporutu and have been closed and capped for over 17 years. Based on the Scholl Canynon LFG generation curve these landfills have negligible LFG emissions.

Colson Road is the most recent and largest landfill which closed in 2019 and contains just under 1 million Tonnes of waste. The final capping on Colson Road is currently ongoing and due for completion by 2024/25. Since the previous GHG inventory in 2017/18 the Colson Road Landfill has had a landfill gas capture system

installed in 2018. Based on data analysed, the gas capture system was approximately 7% effective in destruction of the LFG produced.

The Colson Road LFG Gas Generation modelling was done within the ERP by WSP. This uses the Scholl Canyon LFG generation curve with the data provided from landfill operations on LFG destruction (Ref. Colson Road System Upgrades Memo Rev.4 + WSP NPDC ERP Analysis Graphs Final – Community Solid Waste Tab). The assessment did not include for 10% reduction of LFG emission from the Landfill Cap as the cap was just started at the time of the 21/22 inventory.

The previous 2017 /18 GHG inventory considered the global warming potential for landfills with climate carbon feedbacks to IPCC FirstOrder Decay model, a model that assumes the organic, degradable component of waste decays slowly across decades, producing both CH4 and CO2. This inventory uses more site specific information and the Scholl Canyon LFG model which has approximately doubled the GHG emissions estimate for the Colson Road Landfill while ruling out GHG emissions from the older landfills +18 years old as immaterial.

There are still uncertainties in this modelling based on the assumption that the LFG that is not captured and destroyed is all being released to the atmosphere without oxidation through the soil layers above the waste. This is conservative in that it may overpredict the GHG emissions of the Colson Road landfill and therefore the accuracy of this data is at D2, derived from waste volumes and accepted formulas with a satisfactory accuracy.

Modelled within NPDC Emissions Reduction Technical Report (22-2-18) –based on "NPDC ERP Analysis Graphs Final :- Saved as – Colson Rd.LFG modelling 21 22".xls. and included in 21/22 GHG Inventory as Tab Colson Road LFG.

GHG inventory 21/22 = 80,663+66,267/2= 73,465 Te CO2 e

The total share of the GHG emissions from Colson Road has been attributed to NPDC based on Operational control of the landfill. This is a change from previous 2017/18 inventory by AECOM who shared the % of GHG emissions among the three Territorial Authorities by amount of waste contributed on that year.

Waste Water Treatment Plant (WWTP)

Emissions associated with NPDC owning and operating the New Plymouth Wastewater Treatment Plant New have also been included in Scope 1, Scope 2 and Scope 3.

Table 3 NPDC main WWTP Emissions Sources

Scope	Source	Quantity Te CO2e
Scope 1	Biogenic N_20 and CH_4 from BOD process. Water NZ Calculation	1,551
Scope 1	Fossil Gas for Thermal Dryer	1,409
Scope 2	Electricity for plant	353
Scope 3	Waste Sludge to Landfill – Hampton Downs + Screenings to Bonnie Glenn	74

2.2.2 Scope 2 Electricity

All Electricity Data is available for electricity usage across the different NPDC operated facilities. NPDC have been operating an energy management software since 2016 which records historical trends. The energy management software was previously E-Bench and has recently been shifted to ESP Utility Hub. Data accuracy is high (M1).

The emission factors for electricity were taken from MfE (2023) and were based on the 2022 average. NPDCs largest electricity using sites are shown in the Figure 5 below. NPDC have an Energy Management Team that has been implementing energy efficiency projects to decrease energy use across its facilities.

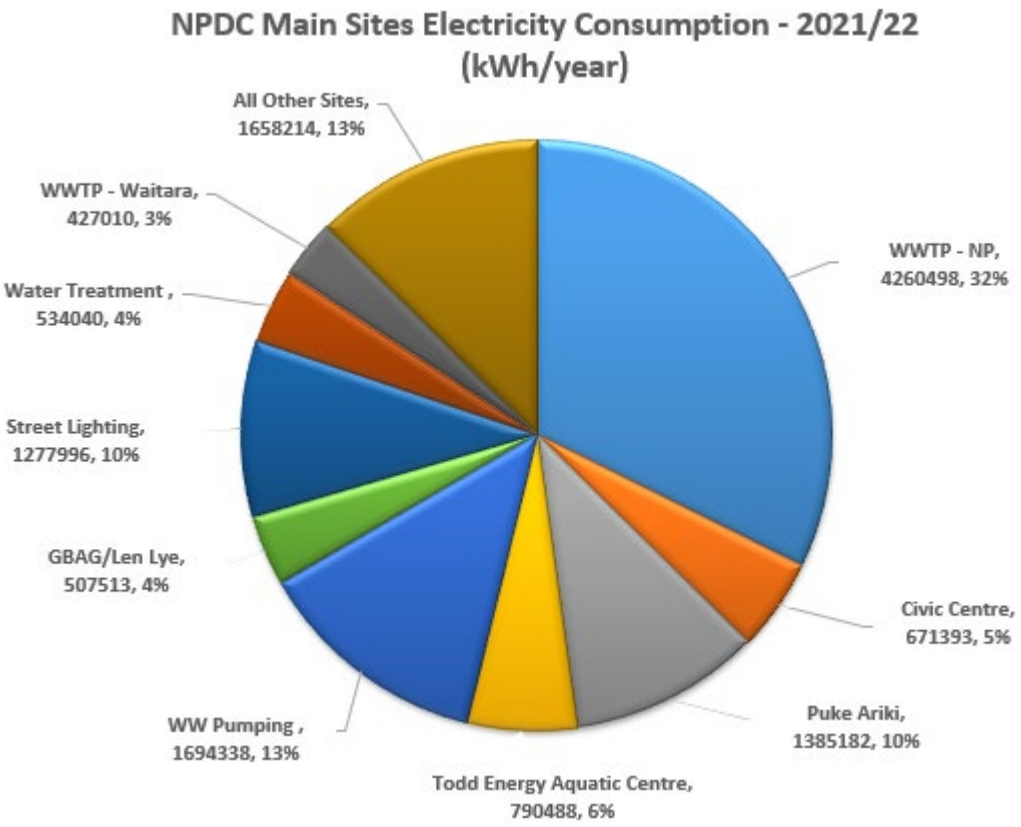

Figure 3:NPDC Main Scope 2 Sites by % of Total for FY 2021/22

2.2.3 Scope 3 Other Indirect Emissions

Table 4 NPDC Scope 3 Inclusions and Exclusions:

Subcategory - Scope 3 Category (SBTi/GHGP S3)	Source	Included yes or no
1. Purchased goods and services	NPDC OPEX Spend including: Consumables ie. Paper & Chemicals, Professional Services, IT services, Maintenance, library books and IT goods.	Yes
2. Capital goods	NPDC CAPEX Spend including: Construction cost to delivery infrastructure assets Capital Programme.	Yes
3. Fuel and energy related activities	Transmission and distribution losses for electricity & gas	Yes
4. Upstream transportation and distribution	Community and Operational Waste Transportation out of the district	Yes
5. Waste generated in operations	Community Kerbside Collections (Landfill, Food Scraps, Recycling) + Organisational Waste	Yes
6. Business travel	Travel Tab	Yes
7. Employee commuting	Commuting Tab	Yes
8. Upstream leased assets	NPDC is a lessee for 4 properties mainly associated to carparks. These emissions are immaterial but reported for completeness.	Yes
9. Downstream transportation and distribution		No
10. Processing of sold products		No
11. Use of sold products		No
12. End-of-life treatment of sold products		No
13. Downstream leased assets	Leased Land for Grazing	Yes
14. Franchises		No
15. Investments		No

Business Travel – Air Travel

Air travel data has been sourced from the Orbit Carbon Emission report. It has been categorised by 'Domestic', 'Short Haul International' and 'Long Haul International'.

Business Travel – Taxis, Private mileage claims and Accommodation

NPDC provided dollar values of taxis and private mileage spend. NPDC provided the dollar value of money spent on business accommodation.

However, to calculate emissions accurately, the number of room nights stayed in hotel accommodation is needed rather than the dollar value spent. We estimated the number of nights for both entities based average dollar spend per night. For NPDC we used an average of 165NZD per night. Staff private vehicle mileage claims in in dollars spent was provided by the NPDC.

Emission factors were taken from MfE (2023). The activity data is of a lower quality (D1).

Employee Commuting

Employee commuting data has been sourced through a staff survey conducted by NPDC in 2023. 21/22 FTE numbers were used to apply this commuting data to the 21/22 time period. This data was used to estimate the GHG emissions associated with employee travel to and from work during the reporting year.

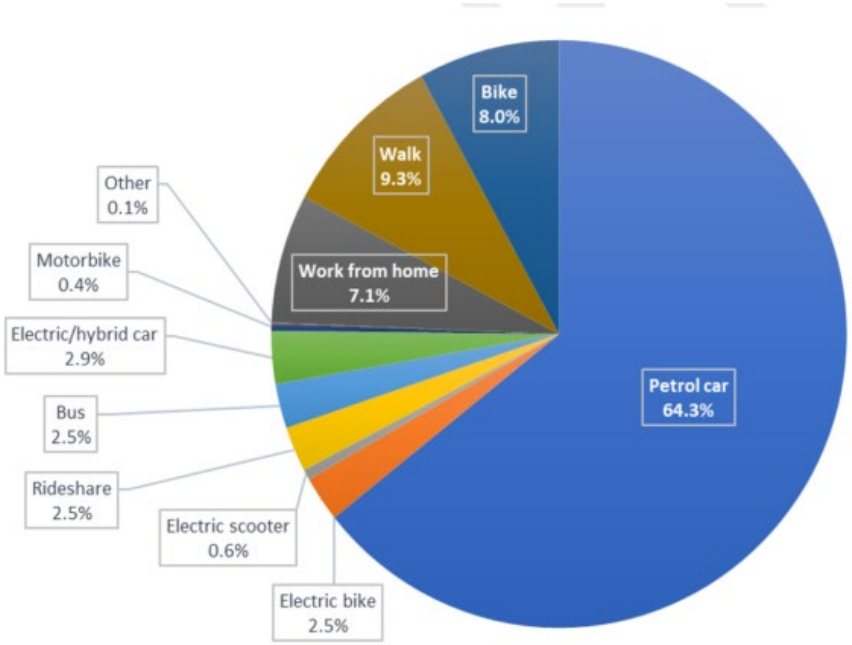

Figure 3 Percentage of trips to and from work by mode

Figure 4:NPDC LetsGo Travel Survey FY 2021/22

Transmission and distribution losses for electricity & gas

The emissions factors used for transmission and distribution losses from electricity and gas consumption from are based on national average figures for electricity and natural gas lost in the transmission and distribution network provided by MfE (2023).

Waste

NPDC's organisation waste is managed by Waste Management. Waste Management send in-organic waste to Bonnie Glen, organic waste to commercial composting in Taranaki, and recycling to NPDCs MRF (Material Recycling Facility). The MRF further distributes this waste to Envirowaste for recycling at various places across the country.

NPDC also manage the community kerbside collection of Food Scraps, Recycling and Landfill Waste. This contract is with Envirowaste who transport Food Scraps to Hampton Downs for Composting, Bonnie Glenn for landfill, and Recycling to various places across the country. (ie. HDPE and PP to Aotearoa NZ Made in Palmerston North and PET to Flight Plastics in Lower Hutt .) NPDC have not currently used specific emissions factors for recycling and have defaulted to MFE.

There are Site Specific Emissions factors (Unique Emissions Factor) for the both Hampton Downs and Bonny Glen which have been used in the calculations of GHG emissions. NPDC have decided to use MFE 2023 generic emissions factor based on comments from the GHG audit.

Waste generated in operations has been broken down to general waste to landfill, mixed recycling and recycled food waste. Data was provided by Waste Management (the Council's waste service provider) in kilograms. The activity data is of a high quality M1.

Currently, NPDC do not have specific emissions factors for its end of life recycling facilities. Further, the MFE 2023, is also silent on Recycling emissions factor. This inventory uses recycling emissions factor from the **UK Government Greenhouse gas reporting: conversion factors 2022**.

Water Supply

Emissions from water supply are included within the operational energy use for the Water Treatment Plants (WTP). There are 4 WTPs in total with the New Plymouth WTP servicing the majority of the district.

Wastewater Treatment Plant

NPDC operates the NP wastewater treatment plant (WWTP) which consumes 65% of NPDC's fossil gas (Scope 1) and approximately 31% of NPDC's electricity (Scope 2). It is also a large producer of N_20 and CH_4 emissions due to the processing of Waste Water. NPDCs WWTP is an aerobic process as described on a high level on NPDCs website.

WWTP GHG emissions were calculated based on Water NZ, Carbon Accounting Guidelines for Wastewater Treatment Aug. 2021. The BOD methodology was chosen as it was the most conservative (highest GHG emissions).

Purchased Goods and Services (Cat 1), Capital Goods (Cat 2), Upstream Transportation and Distribution (Cat 4) & Upstream Leased Assets (Cat 8)

Estimated emissions under categories **Cat1** and **Cat2** were previously calculated using the Motu (2014) emissions factors for average industry sectors and activities in New Zealand and have now been calculated using **Toitu / Auckland City Council, Capital Carbon Emissions Report (Ref.4) and Ref.5, Consumption Emissions Modelling Market Economics, Auckland Council, March-2023.**

Under Cat 1 Purchased Goods and Services emissions sources were included such as office paper, contractors used for professional services, fleet and plant consumables and maintenance and chemicals use.[3]

The Toitu report (Ref.4) provides High level spend-based emission factor recommendations for capital carbon emissions relating to New Zealand Local Government Long-Term Plans. They are reported in kilograms of carbon dioxide equivalent per dollar (kg CO2e/$).

Activity data (dollar spend information) for Cat 2 capital goods was extracted from the general ledgers of the Council Finance system (Tech1). Estimated emissions under these categories were also calculated using Ref. 4 &5.

[3] Within this category there are different data sources and the data quality of each source is E1.
[11] The quality of this data is robust and all emission sources are rated as D1.

Emissions associated with the lease of operating premises, including a library, land and sports ground has been included within Upstream Leased Assets (Cat 8). The data quality for this category is E1.

Emissions associated with Upstream Transportation and Distribution are due to community waste and its Third-party transportation services purchased by NPDC in the reporting year. Waste is transported via third party from NPDC to Landfill (Bonnie Glenn) and Composting facilities (Hampton Downs).

Forestry

NPDC have the following forestry lands as displayed in the NPDC Forestry Management Plan 2022. NPDC have received 15,420 NZU Carbon Credits for their pre -1990 forest land that have been claimed previous to this inventory. Hence, there are no forestry carbon sinks to claim within the context of this GHG inventory.

A key initiative in NPDCs organisational emissions reduction plan is planting our place with an objective of planting 40 ha of native forest on council land over the next decade to sequester carbon and increase biodiversity within NPDC boundary. Planting our Place has been modelled in emissions reduction projections within NPDCs organisational ERP. At the time of this inventory no emissions have been sequestered.

Table 5 NPDC Forestry Areas

Table 4: Net stocked area

Forest	Area as at June 2022 valuation (ha)
Alfred Road	3.9
Busing	21.0
Colson Road	33.9
Dudley	9.8
Duthie (JV)	21.1
Herekawe	3.1
King Road	15.8
Mangamahoe	159.3
McKay (JV)	74.2
Total	342.1

NPDC have a forestry Policy which states, “Forestry investment is considered to be a secondary objective for the Council to the extent that it was not the dominant purpose for acquiring the current land in the first place and will not in future be the dominant reason for acquiring further land or land rights;” – Microsoft Word - ECM_1253503_v1_P04-008 Forestry (npdc.govt.nz)

Leased grazing land

Emissions associated with NPDCs leased grazing land is a Scope 3 emissions source based on Downstream leased assets. NPDC leases out 316 hectares of grazing land across 57 different grazing leases. To estimate the emissions associated with these grazing leases, NPDC used the data and emissions factors developed by the STDC Environment and Sustainability team in collaboration with EKOS in 2022.

Grazing emissions consist of enteric fermentation emissions, manure management emissions, agricultural soils emissions, and fertilizer use emissions. The calculations for each of these emission sources is described in the Appendix B.

Total emissions associated with STDC's 872.33 hectares of leased land were derived as 3,624 tonnes CO2-e for the 2020/21 financial year. These emissions are comprised of the following:

Table 7: Leased Land Agriculture Emissions Sources

Agriculture Source	GHG emissions, tonnes CO_2-e
Enteric fermentation emissions	2,820
Agricultural soils emissions	518
Fertilizer use emissions	177
Manure management emissions	107

NPDC uses the combined grazing emissions factor of 3624 tonnes CO_2-e /872 hectares = 4155 kg CO_2-e / Ha. This is derived and has the data quality of D2.

3.0 Assumptions and Data Quality

For a full list of all assumptions and limitations in relation to each source, please see the 'Notes' column for each emission source under NPDC Org Inventory Results 2021-2022 excel workbook.

A description of the data quality indicators used in the above sections, with explanations of the terms used in the table, is provided below.

Table 9: Data Quality

Data management	Data collection		
	Measured	Derived	Estimated
Robust	M1	D1	E1
Satisfactory	M2	D2	E2
Questionable	M3	D3	E3

Measured = Data directly provided by a service provider, contractor or directly obtained from a monitoring device. For example, electricity invoices, contractor receipts, emissions monitoring equipment, incident reports, consultant reports etc.

Derived = Data obtained from calculations, mass balances, use of physical/chemical properties, use of coefficients and emission factors etc., for example converting cubic meters of waste into tonnes.

Estimated = Usually, where there is no other available method for obtaining the data. Such data could be pro-rated on previous results, use precedents or historical data, or even be based on a calculated guess.

Robust = Evidence from a sound, mature and correct reporting system, where room for error is negligible. Examples would include well-kept spreadsheets, databases and on-line reporting.

Satisfactory = Examples would include manual, but structured keeping of records, files and results. Some potential for error or loss of data.

Questionable = No logical or structured approach to data or record keeping. High potential for error &/or loss of data. Data may appear to differ from those initially reported.

3.1 Inventory Auditing

The emission inventory was completed in alignment with ISO 14604-1, 2018.

This is the first NPDC GHG inventory third party verified in alignment with ISO 14064-3, 2019. The independent verification was completed by McHugh & Shaw Limited and that the assurance level achieved is Reasonable Assurance ISO Cat 1-2 and Limited Assurance ISO Cat 3-6.

3.2 Data Quality Improvement

The below table summarizes the various sources of the data that should be improved for the next inventory.

Table 10: Data Quality Improvement

Data Source	Data Quality	Materiality (>5%)
Refrigerants	D2	No
Employee Commuting Data	D2	No
Business Travel Accommodation	D2	No
Capital Goods (excluding Office Paper)	E2	Yes
Purchased Goods and Services	E2	Yes
Colson Landfill Gas	D2	Yes
Upstream Transportation and Distribution	E2	No
Upstream Leased Assets	D2	No
Downstream Leased Assets	D2	No
Operational Mixed Recycling	E2	No

To increase the accuracy of subsequent corporate carbon footprints it is recommended that NPDC:

1. Increase the data quality of upstream scope 3 emissions. Currently a spend based analysis has been completed for upstream Scope 3 GHG emissions based on the latest Toitu and Local Government emissions factors (Ref.4 & 5) . Increase the accuracy of activity data and emissions factors by collecting detailed information from Capital Goods and Purchased Goods and Services. This is being planned as part of NPDCs Infrastructure Decarbonisation Process.

2. Increase accuracy of Colson Road Landfill Gas Emissions based on Flux Box Emissions monitoring across the landfill. This is currently being planned as part of NPDCs Landfill Gas Capture Improvement Project.

3. Increase accuracy of emissions factor for NPDCs upstream and downstream leased assets including Grazed Land.

4. Collect records of refrigerant top-ups (maintenance). This will ensure that fugitive emissions from these sources can be calculated and included in the boundary in future footprints.

5. Survey employee travel behaviours multiple times throughout the year vs. a randomised week during summer period.

4.0 Emissions Summary

This section presents the results of the NPDC corporate carbon footprint. It provides:

- a broad summary covering all activities
- an outline of the corporate emissions
- a focus on each of the key emission sources.

Emissions are presented in carbon dioxide equivalent (CO_2e), a standard unit for measuring and reporting greenhouse gas emissions.

4.1 All Activities and Groups

In 2021/22, NPDC's carbon footprint is estimated as 35,223 Te CO_2e which excludes the closed landfill. Table 11,12 and 13 provides a summary breakdown of all the emissions included in the carbon footprint. When the closed landfill is included the emissions jump to 105,014 Te CO_2e. For the purpose of this baseline year the closed landfill has been excluded from the total based on standard practice.

Table 11: NPDC 21/22 Inventory Summary

ISO Cat	Source	Te CO_2e	% of total	% of Total (LFG removed)	CO2 (Te CO2-e)	CH4 (Te CO2-e)	N2O (Te CO2-e)
	Scope 1	**74,012**		**4,220**	**2,338**	**70,194**	**1,436**
Cat 1	Refrigerants	44	0.0%	0.1%	-	-	-
Cat 1	Natural (reticulated) Gas	2,060	2.0%	5.8%	2,055	5	1
Cat 1	Fleet Petrol	167	0.2%	0.5%	281	0	4
Cat 1	Fleet Diesel	285	0.3%	0.8%	-	-	167
Cat 1	Colson Road Landfill Gas	69,792	66.5%	NA	-	69,792	-
Cat 1	LPG	106	0.1%	0.3%	-	106	-
Cat 1	Fertiliser	8	0.0%	0.0%	3		5
Cat 1	Waste Water Treatment Plant (WWTP)	1,551	1.5%	4.4%	0	292	1,259
	Scope 2	**988**		**988**	**960**	**26**	**2**
Cat 2	Electricity	988	0.9%	2.8%	960	26	2
	Scope 3	**30,014**		**30,014**	**815**	**6,257**	**109**
Cat 6	Community Waste to landfill	5,916	5.6%	16.8%		5,989	
Cat 4	Organisational Waste to landfill	90	0.1%	0.3%	-	90	
Cat 6	Community Food Composting	256	0.2%	0.7%	256	163	93
Cat 4	Organisational Food Composting	22	0.0%	0.1%	22	14	8
Cat 6	Community Mixed recycling	99	0.1%	0.3%	-		-
Cat 4	Organisational Mixed recycling	3	0.0%	0.0%			
Cat 4	Purchased Goods & Services	14,695	14.0%	41.7%	-	-	-
Cat 4	Capital Goods	6,549	6.2%	18.6%	-	-	-
Cat 4	T&D Loss Electricity & Gas	191	0.2%	0.5%			
Cat 4	Upstream Leased Assets	78	0.1%	0.2%	-	-	-
Cat 3	Business Travel (airtravel, taxis and accom)	19	0.0%	0.1%			
Cat 3	Employee Commuting	193	0.2%	0.5%			
Cat 5	Downstream Leased Assets	1,313	1.3%	3.7%			
Cat 3	Upstream trasportation and distribution	592	0.6%	1.7%	537	1	9
	Total	**105,014**	**100%**	**100%**	**4,113**	**76,477**	**1,547**
	Total excluding closed landfill	**35,223**			**4,113**	**6,686**	**1,547**

Table 12: NPDC 21/22 Inventory Summary by gas type

GHG Emissions by Scope		
GHG by scope	**Total excluding closed landfill**	**% TOTAL (excl closed landfill)**
Scope 1	4,220	12%
Scope 2	988	3%
Scope 3	30,014	85%
Total	**35,223**	**100%**
Emissions per FTE (tCO2e)	56	

Table 13: NPDC 21/22 Inventory Summary by ISO Category

ISO Cat.	Scope 3	tCO2e	% of scope 3 emissions
Cat 6	Community Waste to landfill	5,916	20%
Cat 4	Organisational Waste to landfill	90	0%
Cat 6	Community Food Composting	256	1%
Cat 4	Organisational Food Composting	22	0%
Cat 6	Community Mixed recycling	99	0%
Cat 4	Organisational Mixed recycling	3	0%
Cat 4	Purchased Goods & Services	14,695	49%
Cat 4	Capital Goods	6,549	22%
Cat 4	T&D Loss Electricity & Gas	191	1%
Cat 4	Upstream Leased Assets	78	0%
Cat 3	Business Travel (airtravel, taxis and accom)	19	0%
Cat 3	Employee Commuting	193	1%
Cat 5	Downstream Leased Assets	1,313	4%
Cat 3	Upstream trasportation and distribution	592	2%
	Total	**30,014**	**100%**

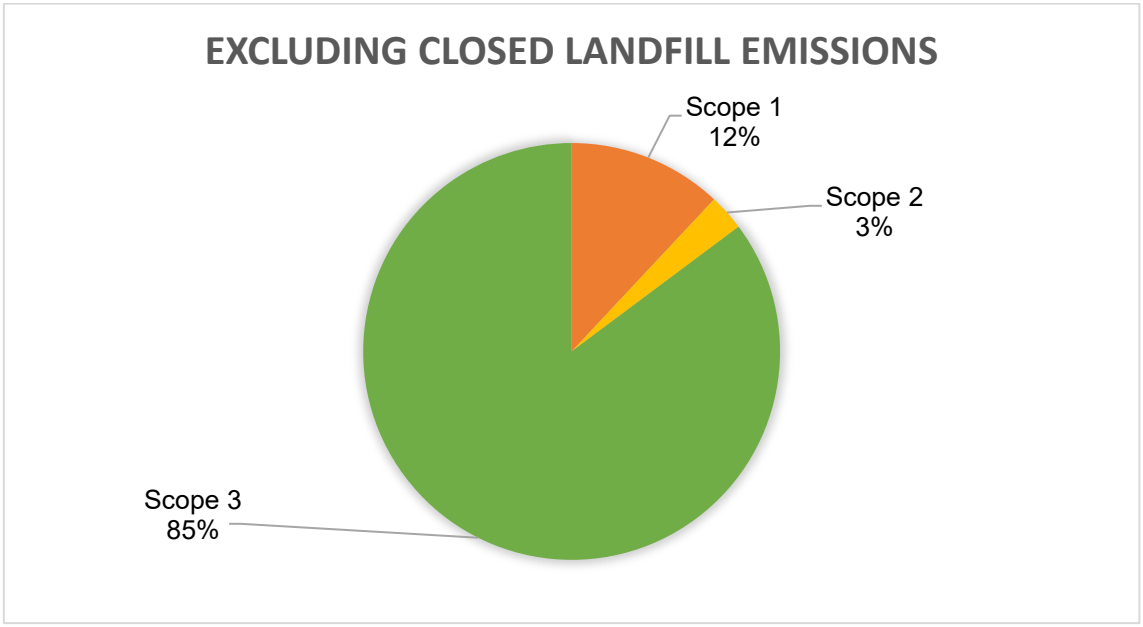

Figure 5 – NPDC 21/22 % Total Emissions by Scope (Excluding Landfill Gas)

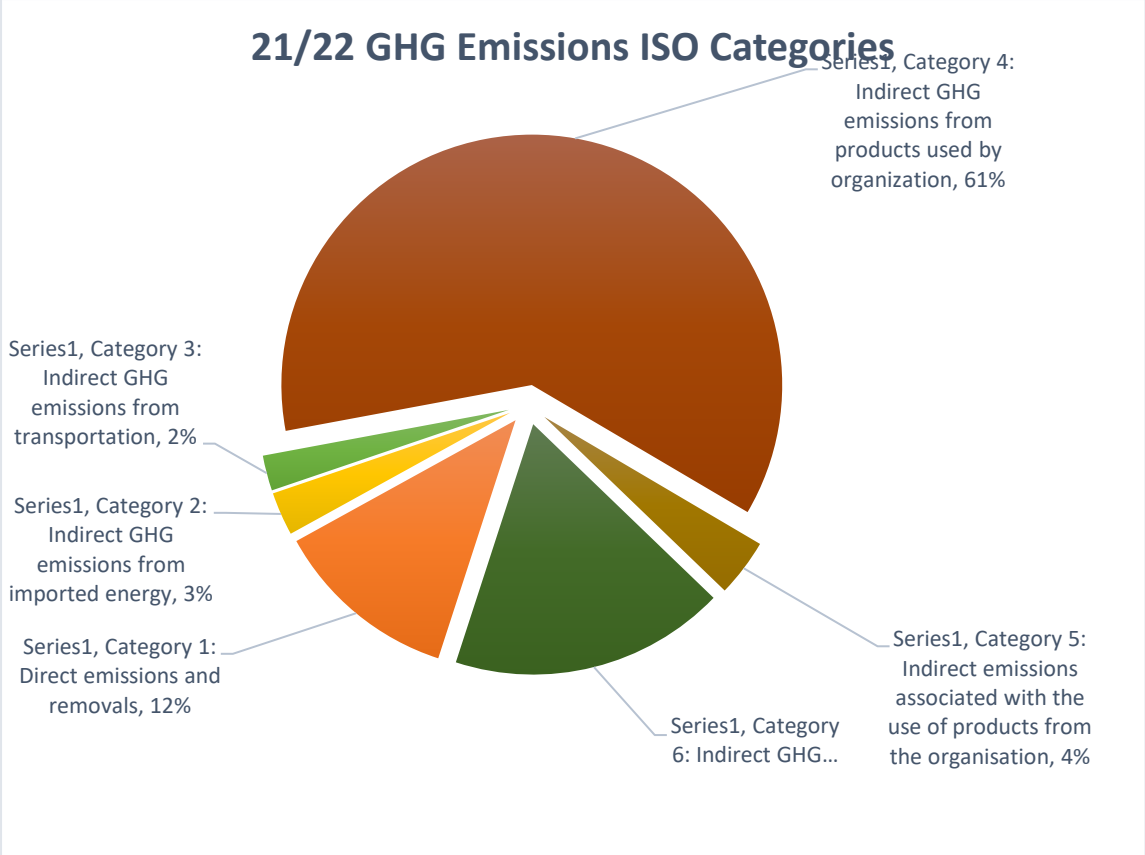

Figure 6b – NPDC 21/22 % Total Emissions by ISO Categories (Excluding Landfill Gas)

4.2 Scope 1 / Category 1- Direct Emissions

Scope 1 emissions represent the second largest source of emissions, accounting for 12% of the overall footprint. Most of the emissions come from fossil fuels and the WWTP.

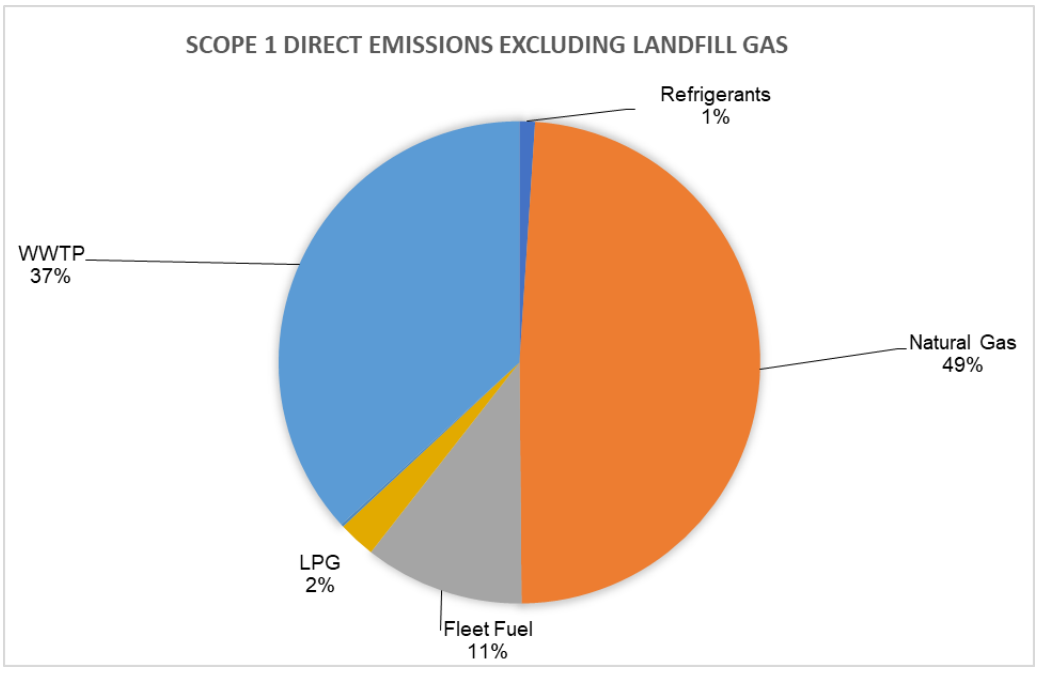

Figure 8 – Scope 1 / Category 1 GHG emissions.

4.3 Scope 2 / Category 2 - Emissions

Scope 2 emissions are entirely generated from use of grid supplied electricity, resulting in 988 Te CO_2e, comprising ~3% of NPDC's overall emissions. Main sources can be seen in Figure 3, section 2.2.2.

4.4 Scope 3 Emissions

Scope 3 (indirect) emissions totalling 30,014 Te CO_2e (85% of total emissions) are generated from several sources (see Figure 9). The largest contributors are purchase of the goods and services (49%), followed secondly by Capital Goods (21.8%) and thirdly by NPDC's community waste to landfill (~21.8%).

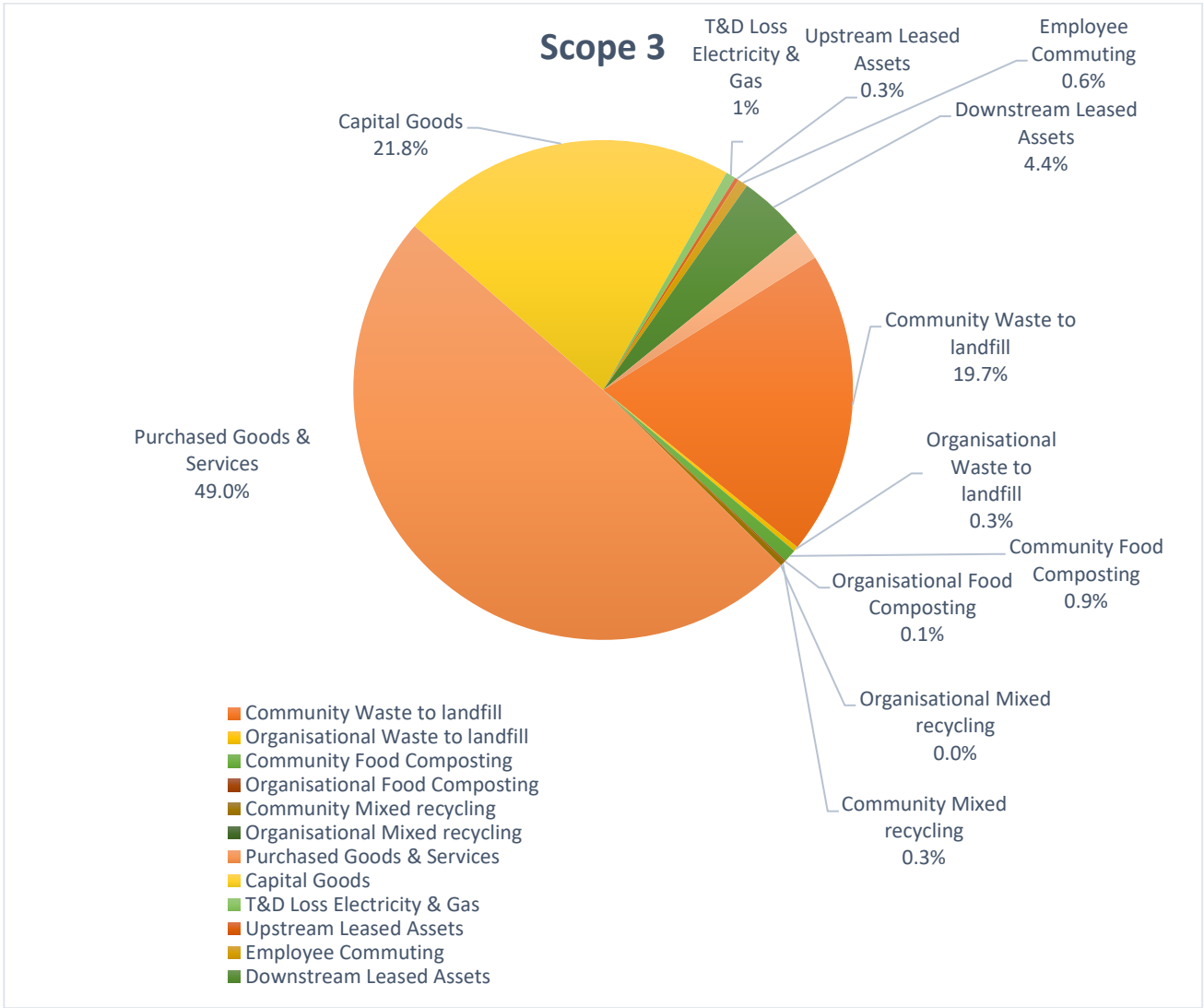

Figure 9 - NPDC 21/22 Scope 3 emissions by source

4.5 Refrigerants

HFCs, PFCs and SF_6 represent GHGs with high global warming potentials. Their accidental release could result in a large increase in emissions for that year, therefore the stock holdings are reported in Refrigerants Tab within the GHG inventory data and results. Emissions from losses of refrigerant are included in the organisation total and have been estimated based on MFE 2022. Refrigerant holdings were updated by NPDCs Energy Management Team in 2023 and capture the main sources.

5.0 Results by Activities and Groups

The following results illustrate the activity-related emissions for NPDC e.g. 'energy type'-related, or transport-related.

5.1 Electricity Use

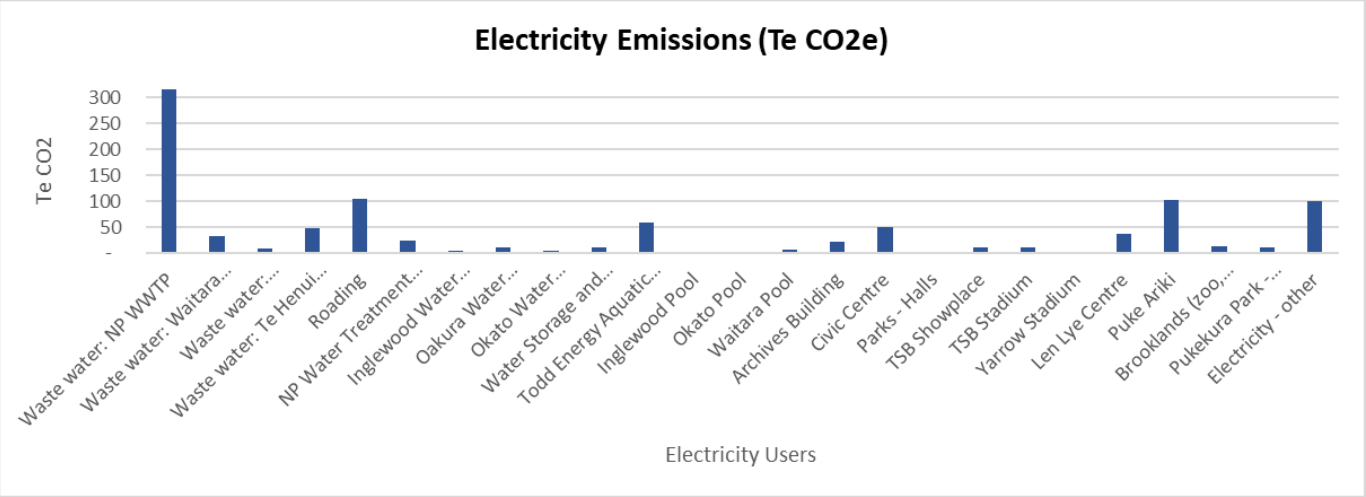

Figure 10- Electricity Emissions by Source

Total electricity emissions are calculated to be 988 Te CO_2e (excluding Transmission & Distribution losses but including CCO electricity sources). The NPDC Wastewater Treatment Plant has the largest electricity use at 32% of total electricity use as per Figure 10. The second largest source is for Puki Ariki and Roading (street lighting), at 10% each of the total electricity use. This includes electricity used for streetlights and substations.

5.2 Fossil Gas Usage

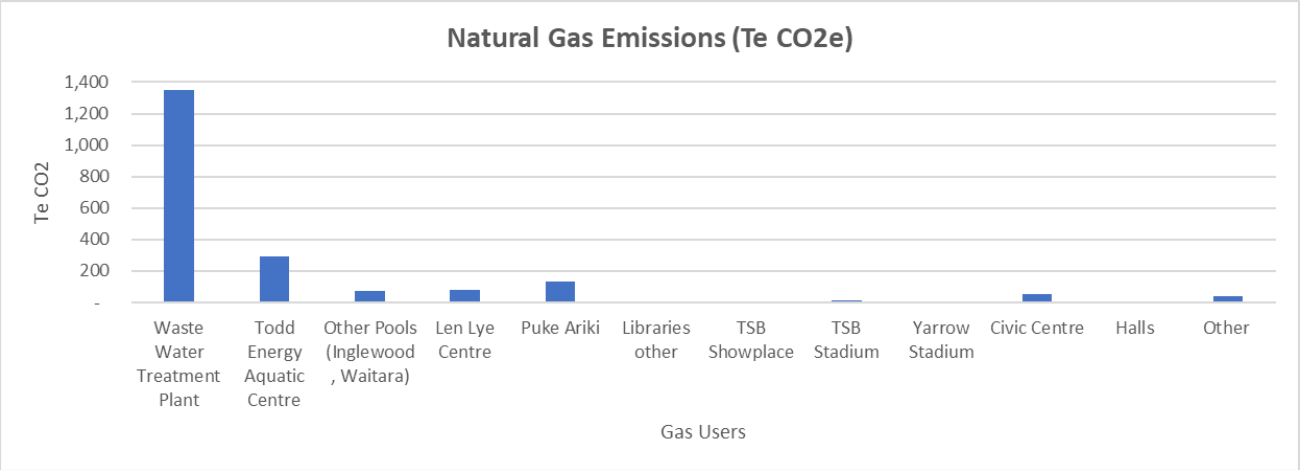

Figure 11 – Natural Gas Emissions by Source

Total natural gas emissions are calculated to be 2,060 Te CO_2e (excluding Transmission & Distribution losses) with 65% produced by the NPDC Wastewater Treatment Plant TDF site as per Figure 11 and Figure 12.

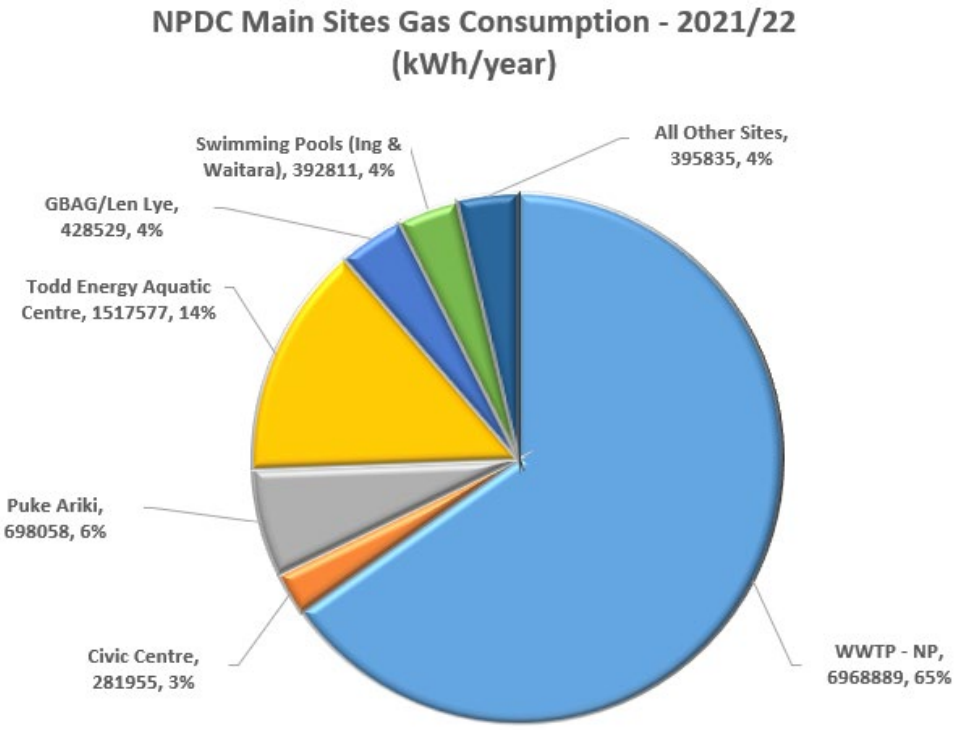

Figure 12: NPDC Main Fossil Gas Sites by % of Total for FY 2021/22

5.3 Transport Emissions

Figure 13 below shows that fleet fuel, employee commuting and air travel are responsible for most transport-related emissions.

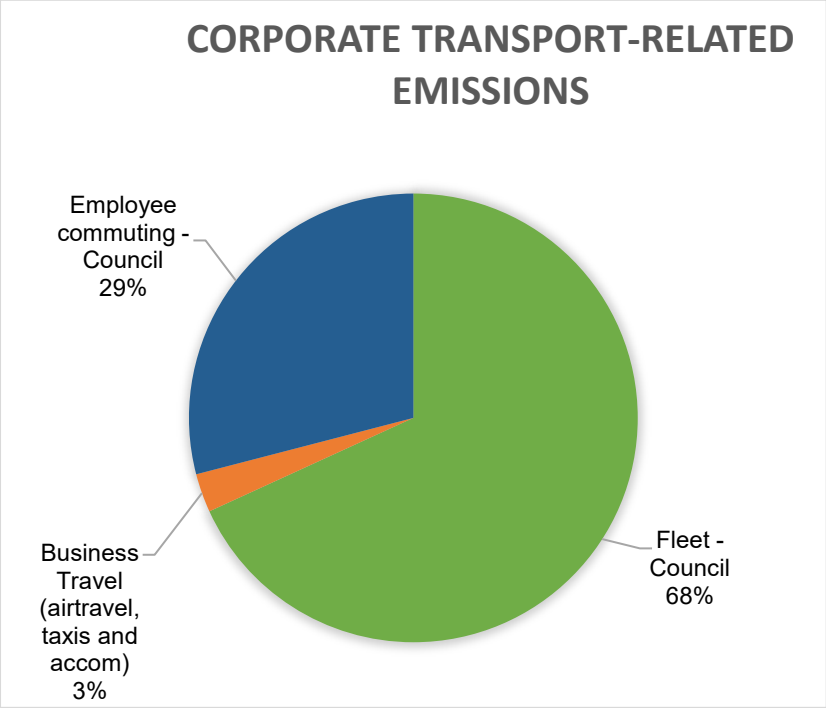

Figure 13-Transport-related Emissions per Transport Mode

Transport emissions include fleet vehicle travel, employee commuting, air travel, rental cars and taxis, and mileage business claims for employee travel (private vehicle). Fleet fuel and employee commuting are the major contributors to transport emissions at 68% and 29% respectively.

Most of the 116 fleet vehicles are fuelled by either petrol or diesel with 2 electric vehicles as of 21/22. The results of an employee commute travel survey in 2023 was used as the foundation to estimate commuting emissions.

6.0 References

Carbon footprint calculations

1. MfE (2023) – Ministry for the Environment, New Zealand, Measuring emissions: A guide for organisations: 2023 emission factors summary & workbook.
2. World Resources Institute and World Business Council for Sustainable Development (2004), The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard, Revised Edition, USA.
3. World Resources Institute and World Business Council for Sustainable Development (2011), Corporate Value Chain (Scope 3) Accounting and Reporting Standard, USA.
4. Toitu, July 2023, Capital Carbon Emissions, High Level Spend-based emissions factor recommendations for capital carbon emissions relating to New Zealand Local Government Long-Term Plans.
5. Consumption Emissions Modelling Market Economics, Auckland Council, March-2023
6. WATER NEW ZEALAND (2022) - Standard Methods, Carbon accounting, guidelines for wastewater treatment: CH4 and N2O
7. WATER NEW ZEALAND (2022) - Navigating to Net Zero: Aotearoa's water sector low-carbon journey
8. UK Government Greenhouse gas reporting: conversion factors 2022 **,** Greenhouse gas reporting: conversion factors 2022 - GOV.UK (www.gov.uk)
9. NPDC Emissions Reduction Technical Report – WSP – 2022

7.0 Glossary

Carbon Dioxide Equivalent (CO_2e)	A standard unit for measuring carbon emissions. The impact of each different GHG is expressed in terms of the global warming potential (GWP) of one unit of CO_2. Standard ratios are used to convert gases into equivalent amounts of CO_2; these are based on each gas' GWP.
Carbon Footprint	A measure of the GHGs emitted by a particular organisation. Typically expressed in terms of CO_2e, and for a 12-month reporting period.
Emission Factor (EF)	A metric that converts a specific emission source, such as a litre of diesel, into CO_2e.
Global Warming Potential (GWP)	A measure of a gas' ability to cause radiative forcing in the atmosphere (or global warming) relative to that of CO_2. For example, sulphur hexafluoride has 23,900 times the GWP of CO_2, thus is 23,900 times more potent at contributing to global warming than CO_2.
Greenhouse Gas (GHG)	Greenhouse gases are gases that influence the way in which the Earth's atmosphere traps heat. Increasing levels of GHGs in the atmosphere are causing the phenomenon of climate change.
Greenhouse Gas Protocol	Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard, 2004 (GHG Protocol); and the Corporate Value Chain (Scope 3) Accounting and Reporting Standard, 2011 has been used in the preparation of this calculation. This protocol provides guidance for organisations preparing a GHG emissions inventory. It defines three scopes (or operational boundaries) for accounting and reporting purposes (explained below).
Scope 1 Emissions	Direct greenhouse gas emissions that occur from sources owned or controlled by the organisation, such as emissions from the combustion of diesel in the vehicle fleet.
Scope 2 Emissions	Emissions associated with the purchase of electricity that is consumed by the organisation.
Scope 3 Emissions	An optional reporting category that covers all other indirect emissions. These emissions are a consequence of the organisation's activities but occur from sources it does not own or control. Examples include the embodied carbon in materials and air and taxi travel.
ISO standard 140641:2018 – Greenhouse Gases	This standard details principles and requirements for designing, developing, managing and reporting organization-level GHG inventories. It includes requirements for determining GHG emission and removal boundaries, quantifying an organisation's GHG emissions and removals, and identifying specific company actions or activities aimed at improving GHG management. It also includes requirements and guidance on inventory quality management, reporting, internal auditing and the organization's responsibilities in verification activities.

8.0 Appendix A - Calculation of Leased Grazing Land – STDC / EKOS

Leased grazing land

Emissions associated with STDC's leased grazing land is a new emissions source for 2020/2021. STDC leases out 872.33 hectares of grazing land across 62 different grazing leases. To estimate the emissions associated with these grazing leases, the STDC Environment and Sustainability team's Summer University Student called all farmers with STDC leases over 15 hectares (10 farmers total were reached). While most STDC grazing leases are small, a few farmers hold large (50+ hectare) leases. Consequently, the 10 contacted farmers represent 75.49% of all STDC leased grazing land. The farmers were asked what type of livestock (cattle, sheep, or dairy cows) they have on the leased land, how many livestock they run, how many months of the year their livestock are on the leased STDC land, and what type and quantity of fertilizer they use on the leased land. Most farmers could provide data about the number of livestock they have on the leased land with a fairly high level of certainty. However, it was much harder to get clear and confident replies from farmers regarding the type of quantity of fertilizer used. For this reason, emissions calculations associated with fertilizer application have a high level of uncertainty.

STDC Emissions Inventory 2020/2021 32

To estimate the total number of livestock on all of STDC's leased land and fertilizer use on all of the STDC's leased land, the total figures provided by interviewed farmers were summed and then multiplied by 1.3247 (since only 75.49% of STDC's leased land was represented by the interviewed farmers).

Grazing emissions consist of enteric fermentation emissions, manure management emissions, agricultural soils emissions, and fertilizer use emissions. The calculations for each of these emission sources is described in the following pages.

Enteric fermentation

Enteric fermentation is the process by which ruminant animals produce methane through digesting feed. To calculate the emissions associated with enteric fermentation on STDC's leased grazing land, the enteric fermentation emissions factors provided by the MFE 2022 Measuring Emissions: A detailed guide for organisations were utilised.

Enteric fermentation emissions in tonnes CO_2-e: (HDC x GWP) + (HC x GWP) + (HS x GWP)

Where:

HDC = Head of dairy cattle

HC = Head of cattle

HS = Head of sheep

GWP = Global Warming Potential (100-year potential)

Enteric fermentation emissions = (HDC x GWP) + (HC x GWP) + (HS x GWP) =

(451 x 2,264 kg CO_2-e) + (1,114 x 1,540 kg CO_2-e) + (265 x 318 kg CO_2-e) =

1,021,064 kg CO_2-e + 1,715,560 kg CO_2-e + 84,270 kg CO_2-e =

2,820,894 kg CO_2-e =

2,820.89 tonnes CO_2-e

Manure management

To calculate the emissions associated with manure management on STDC's leased grazing land, the manure management emissions factors provided by the MFE 2022 Measuring Emissions: A detailed guide for organisations were utilised. For STDC, manure management emissions are only relevant for dairy cattle.

Manure management emissions in tonnes CO_2-e: HDC x GWP

Where:

HDC = Head of dairy cattle

GWP = Global Warming Potential (100-year potential)
Manure management emissions = HDC x GWP
451 x 238 kg CO_2-e = 107,338 kg CO_2-e =
107.34 tonnes CO_2-e
STDC Emissions Inventory 2020/2021 33
Agricultural soils emissions
Agricultural soils emit nitrous oxide due to the addition of nitrogen to soils through manure, dung and urine.
To calculate the emissions associated with agricultural soils emissions on STDC's leased grazing land, the agricultural soils emissions factors provided by the MFE 2022 Measuring Emissions: A detailed guide for organisations were utilised.
Agricultural soils emissions in tonnes CO_2-e: (HDC x GWP) + (HC x GWP) + (HS x GWP)
Where:
HDC = Head of dairy cattle
HC = Head of cattle
HS = Head of sheep
GWP = Global Warming Potential (100-year potential)
Agricultural soils emissions = (HDC x GWP) + (HC x GWP) + (HS x GWP) =
(451 x 468 kg CO_2-e) + (1,114 x 267 kg CO_2-e) + (265 x 36 kg CO_2-e) =
211,068 kg CO_2-e + 297,438 kg CO_2-e + 9,620 kg CO_2-e =
518,126 kg CO_2-e =
518.13 tonnes CO_2-e
Fertilizer use emissions
The use of fertilisers produces GHG emissions. Nitrogen fertilisers break down to produce nitrous oxide and carbon dioxide (urea). Limestone and dolomite fertilisers break down to produce carbon dioxide.
It was very challenging to obtain clear information from farmer interviews regarding the exact type of fertilizers the farmers use. For this reason, all nitrogen-based fertilizer mentioned by the interviewed farmers has been assumed to be urea nitrogen fertiliser coated with urease inhibitor with an assumed nitrogen content of 46%. Based on these assumptions, STDC lessees applied 36.588 tonnes of nitrogen to leased STDC land.
Fertilizer use emissions in tonnes CO_2-e: KGN x GWP
Where:
KGN = Kgs of nitrogen content of fertilizer applied
GWP = Global Warming Potential (100-year potential)
Fertilizer use emissions = KGN x GWP =
36.588 x 4.86 tonnes CO_2-e = **177.82 kg CO_2-e**
Total agricultural lease emissions
STDC Emissions Inventory 2020/2021 34
Total emissions associated with STDC's 872.33 hectares of leased land are an estimated 3,624.17 tonnes CO_2-e for the 2020/21 financial year. These emissions are comprised of the following:
• Enteric fermentation emissions = 2,820.89 tonnes CO_2-e
• Manure management emissions = 107.34 tonnes CO_2-e
• Agricultural soils emissions = 518.12 tonnes CO_2-e
• Fertilizer use emissions = 177.82 tonnes CO_2-e