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24-Oct-2018

Rotorua Lakes Council Corporate Carbon Footprint

2016-17

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2016-17

Client: Rotorua Lakes Council

Co No.: N/A

Prepared by

AECOM New Zealand Limited
Level 3, 80 The Terrace, Wellington 6011, PO Box 27277, Wellington 6141, New Zealand
T +64 4 896 6000 F +64 4 896 6001 www.aecom.com

24-Oct-2018

Job No.: 60560738

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Quality Information

Document Rotorua Lakes Council Corporate Carbon Footprint

Ref 60560738

Date 24-Oct-2018

Prepared by Letisha Nicholas & Sarah Lindberg

Reviewed by Kerry Griffiths

Revision History

Rev	Revision Date	Details	Authorised	
			Name/Position	Signature
1	24-Sep-2018	Final	Kerry Griffiths Technical Director	
2	28-Sep-2018	Final Draft	Kerry Griffiths Technical Director	
3	24-Oct-2018	Final Report	Maurice Marquardt Principal Sustainability Consultant	

Table of Contents

Executive Summary

The Rotorua Lakes Council has commissioned AECOM New Zealand Limited to calculate its organisational or 'corporate' greenhouse gas (GHG) inventory for the financial year 2016/2017.

Rotorua Lakes Council Te kaunihera o ngā roto o Rotorua (RLC) is New Zealand's first signatory to the UN Global Compact Cities Programme, a world-wide initiative aimed at creating sustainable societies. RLC has also committed to the Global Covenant of Mayors for Carbon and Energy. As part of this commitment, the council worked with Bay of Plenty Regional Council to develop a community carbon footprint.

The corporate GHG inventory will complement the community carbon footprint and provide a baseline to measure the council's own progress towards GHG reduction targets.

Methodology

The preparation of the GHG inventory 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.

The corporate GHG inventory or 'Carbon Footprint' includes as many council operations and activities as was possible within the limits of data availability. As well as the Council itself, the boundary of the footprint includes three Council Controlled Organisations (CCOs): Rotorua Economic Development (trading as Destination Rotorua); Infracore (landscaping, maintenance, cleaning and minor civil works); and Rotorua Airport. As RLC owns a landfill and wastewater treatment plant the emissions associated with these operations are included as direct emissions.

The carbon footprint reports on all direct emissions, indirect emissions from electricity and several other indirect emissions. Exclusions and data limitations are discussed in the body of the report.

Results

In 2016/17, RLC's carbon footprint is estimated as 103,367 tonnes CO_2e (tCO_2e) of which 94,514 tCO_2e are direct emissions (Scope 1), 3,090 tCO_2e are from electricity indirect emissions (Scope 2) and 5,763 tCO_2e are indirect (Scope 3) emissions.

The total emissions excluding the CCOs is 103,161 tCO_2e which is 297.1 tCO_2e./ FTE including the landfill emissions and 26.75 tCO_2e/ FTE excluding the landfill emissions.

Emissions from the landfill are by far the biggest (90%) followed by electricity and purchased goods and services. Although the landfill is now closed the landfill will continue to emit methane from decomposing waste and be a significant source of GHG emissions. The wastewater treatment plant (WWTP) and pump stations are the largest electricity consumers.

Opportunities and Recommendations

We recommend RLC use this baseline carbon footprint to engage with key stakeholders and to set an overall emissions reduction target and/or targets for specific emissions sources. Emissions reduction opportunities to investigate include:

- **Vehicle transport:** Fleet fuel use (along with gas consumption) is the biggest contribution to Scope 1 emissions after the landfill, a number of options are available to reduce fuel use and to promote alternative fuels.
- **Sustainable procurement**: Indirect emissions are generated via operational, maintenance and construction contracts. The procurement process can be used to support achievement of RLC's reduction targets, and to encourage or require suppliers and contract providers to estimate and report their emissions and demonstrate their reduction performance.
- **Reduction in electricity and gas consumption**: The majority of electricity consumption is from the WWTP and pump stations. Energy efficiency measures related to the WWTP and pump stations should be investigated.
- **Landfill-related emissions:** Closed landfill gas reduction using a flare to destroy methane.

1.0 Introduction

Rotorua Lakes Council Te kaunihera o ngā roto o Rotorua (RLC) has commissioned AECOM New Zealand Limited to calculate its organisational greenhouse gas (GHG) inventory for their financial year 2016/2017. This report contains the results, highlights reduction opportunities and recommends next steps.

Rotorua District is 261,906 hectares with a resident population of 71,700. RLC is responsible for a wide range of activities in the district including:

- Provision and management of local infrastructure and services – water reticulation, sewerage and refuse collection, libraries, parks, recreation services, local regulations, community and economic development, and town planning.
- Sustainable management of natural resources including the effects of land use, activities on the surface of rivers and lakes and ensuring sufficient development capacity for residential and business land to meet expected long-term demands of the district.
- Strategic planning for the district – delivered through statutory instruments, such as the district plan, long term plan and other non-statutory documents.

This organisational GHG inventory (Carbon Footprint) is a calculated estimate of all GHGs emitted as a result of activities under the control of the Council between 1st July 2016 and 30th June 2017.

The objectives of this foot printing project are to:

- Provide information to the RLC on their overall organisational GHG emissions for Scope 1, 2 and 3 emission sources
- Highlight key emission sources for future management
- Establish a baseline year for the inventory and provide a standard methodology for use in future years
- Provide RLC with information that it could use to demonstrate to key stakeholders that it is actively involved in monitoring and managing its GHG emissions.
- Recommend high level actions that would enable the Council to reduce its emissions

2.0 Methodology

This 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. This section covers the methodology and approach to developing the Carbon Footprint including: boundary definition and exclusions, emission factors, activity data, assumptions and limitations.

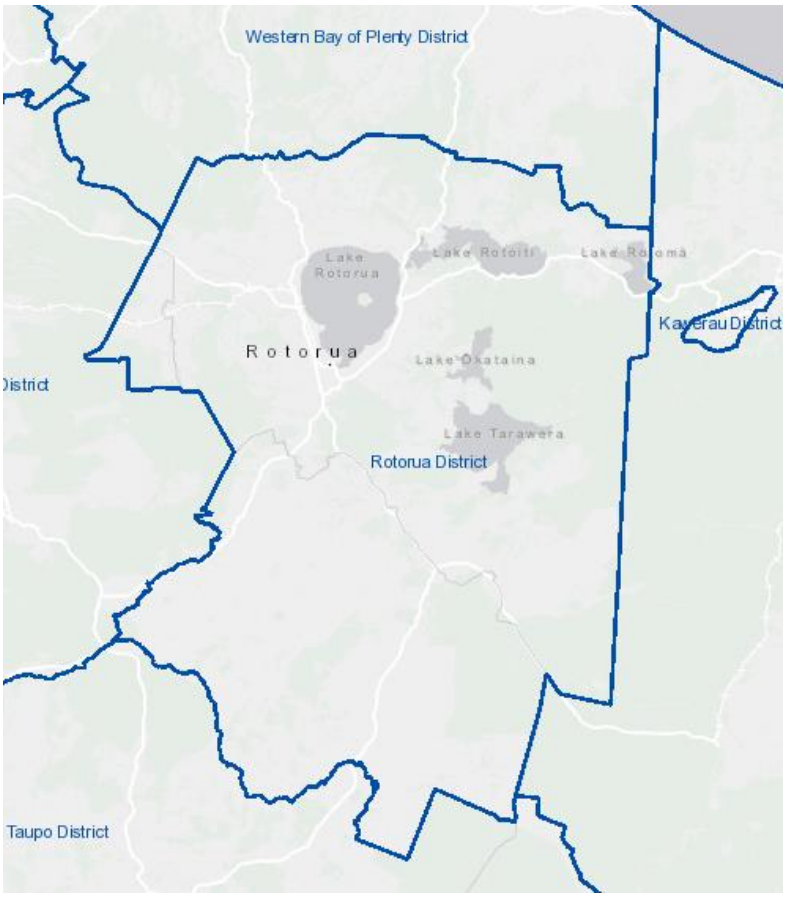

Figure 1 Rotorua Lakes Council location

2.1 Organisational and Operational Boundary

The inventory boundary is made up of an organisational and an operational boundary. The organisational boundary is defined using the control approach. As such, this emissions inventory considers all sources and sinks associated with operations where RLC has control.

2.1.1 Organisational Boundary - Financial Control

All operations over which RLC has the ability to direct financial and operating policies are included in the organisational boundary. Where the Council reviews and reports the finances of an entity in its annual report, these entities have been included in the operational boundary.

The organisational boundary includes three Council Controlled Organisations (CCOs); Rotorua Economic Development (trading as Destination Rotorua), Infracore (landscaping, maintenance, cleaning and minor civil works) and Rotorua Airport. RLC owns 100% of these organisations and also several buildings which are leased to third parties. Further RLC owns the landfill and the wastewater treatment plant and is considered to have financial control over their operations.

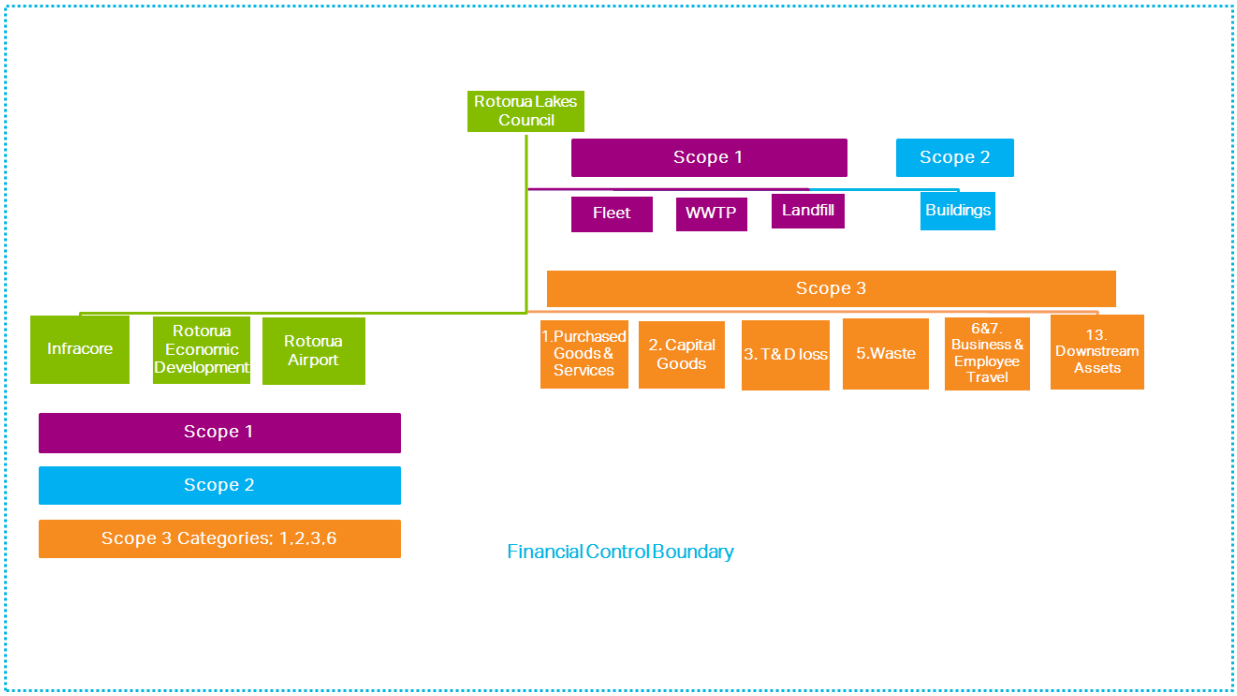

Figure 2 Rotorua Lakes Council activities and organisations included in the organisational boundary

All direct emission sources within the organisational boundary defined above are reported as Scope 1, with all remaining emissions reported as Scope 2 or 3 emissions. The table below provides more explanation on the concept of scope.

Table 1 Scope definitions

	Definition	Example
Scope 1 *Direct emissions*	Direct emissions that occur from sources owned or controlled by RLC	The combustion of fuels in the vehicle fleet
Scope 2 *Electricity indirect emissions*	Emissions associated with the generation of electricity that is purchased by RLC	Electricity consumed at the water pumping stations
Scope 3 *Other indirect emissions*	Emissions that are a consequence of RLC's activities, but from sources they do not own or control	Business air travel

2.1.2 Operational Boundary Exclusions

An operational boundary[1] defines the scope of direct and indirect emissions for operations that fall within a company's established organisational boundary. Potential emission sources and their inclusion in the project boundary were discussed at the project kick off meeting with RLC. Size of emissions, stakeholder interest and potential reduction opportunities, as well as ability to measure emissions were used to determine the materiality of the various emission sources and their inclusion in the boundary (refer Excel calculation tool for further details).

The Council requested the boundary includes as many emissions sources as possible, however the following emissions (Table 2) have been excluded from the operational corporate carbon footprint.

[1] The operational boundary (Scope 1, Scope 2, Scope 3) is decided at the corporate level after setting the organisational boundary.

Fugitive emissions from Refrigerants

This source covers the leakage of refrigerant gases used in both the domestic-sized refrigerators and the heating, ventilation and cooling (HVAC) systems in council buildings and vehicles.

Actual quantities of leaked gases were not measured and the size (charge) and refrigerant types were not provided. Therefore fugitive emissions have been estimated using limited available data and assumptions but not included in the operational boundary due to the imprecision of the estimated emissions. The estimated emissions from fugitive emissions represent a very small percentage of RLC's total emissions. In the future, for completeness, or if changes to heating/cooling systems are likely, or there is particular interest from stakeholders, these emissions could be included in the boundary.

CCO Business Travel

The spend data from Rotorua Economic Development indicated that business travel is likely to be a significant Scope 3 emission for this CCO, however as no breakdown of the travel spend was provided (i.e. taxis, rental cars, air travel – domestic/ international) no emission factor could be accurately applied.

Table 2 Emission sources excluded from RLC footprint

Potential emission source	Reason for Exclusion
Scope 1	
• Wastewater treatment plant (WWTP) petrol consumption (Scope 1)	Only partial data available, low materiality
• Refrigerants from heating and cooling systems used in council buildings and fleet vehicles	Insufficient data available to estimate refrigerant consumption accurately, low materiality
Scope 3	
• All Scope 3 Categories[2]	All spend data has been included where there is an available emission factor except where it was of low materiality/insignificant source of emissions. Refer accompanying Excel tool for more detail.
• Purchased Goods and Services (Category 1) and Capital Goods (Category 2)	No spend data was available for Rotorua Airport so no purchased goods and services or capital goods emissions have been included from the airport. RLC purchased over 200,000L of ethanol for the WWTP however this is consumed as part of the wastewater treatment process and not combusted. Therefore no emissions from the purchase of the ethanol have been included.
• Upstream leased assets (Category 8) • Processing of sold products (Category 10) • Use of sold products (Category 11) • End-of-life treatment of sold products (Category 12) • Franchises (Category 14) • Investments (Category 15)	None identified or not applicable.

[2] The Scope 3 categories are defined in the Corporate Value Chain (Scope 3) Accounting and Reporting Standard (2011)

2.2 Inventory Emission Sources, Emission Factors and Activity Data

This section describes the activities covered within each scope. A brief description is provided on each activity, covering where activity data was collected and where emission factors were sourced, along with a comment on the data quality (see Appendix A 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 from MfE (2016) and Motu (2014).

The individual sources, activity data and emissions calculations are provided in the accompanying Excel calculation tool. This includes activity data and emission calculations for the CCOs.

2.2.1 Scope 1 Direct Emissions

Stationary Combustion (natural gas and diesel)

Natural gas is consumed at a number of RLC operated locations, mostly for heating in buildings. Towards the end of the reporting period, the Civic Centre office building was converted from natural gas to geothermal heating. Water heated geothermally is reticulated through a closed loop system and is disclosed in Scope 1 but is not calculated in Scope 1 emissions as there are no emissions associated with this form of heating. .

The diesel consumed by the WWTP as part of its operation is included in Scope 1 emissions.

Natural gas consumption from metered sites operated by the Airport, Infracore and Rotorua Economic Development has been included in the Scope 1 emissions.

The emission factor for natural gas and diesel was taken from MfE (2016). The gas data collected is considered to be of a high quality while the diesel use has been estimated based on partial data..

Mobile Combustion

RLC has approximately 62 vehicles in its fleet. The vehicles run on either diesel, or regular and premium unleaded petrol. Fuel consumption data has been provided by RLC. Emission factors were taken from MfE (2016). The activity data is considered to be of a high quality.

Fleet fuel use was available for Infracore and Rotorua Economic Development but not available for the Airport.

Waste

Waste generated by the Council is sent to the Rotorua landfill and is therefore included in the overall emissions from the landfill (Scope 1). Recycling from Council operations has been included in Category 5.

Rotorua Lakes Council provides kerbside waste collection and transportation services to the community. During the 2016-17 reporting period, this kerbside waste was transferred to the Rotorua landfill which is owned by the Council but operated by a private contractor.

Green waste and concrete is accepted at the landfill and diverted for reuse. The green waste that is collected at the landfill is transported to a Council-owned compost facility (aerobic). This compost facility is operated by a private contractor. Rubble (also known as ‘hardcore’) is diverted from landfill and reused in roading construction projects.

Waste data for the landfill from 1996 to 2012 was provided by RLC. Waste data prior to 1996 was estimated based on population figures and average waste generation per person in New Zealand provided by StatsNZ (2018) and MfE (2016) respectively. SWAP data describing the waste composition was available for 2009 and 2017. This SWAP data was used and interpolated for 2009 to 2016 and pre-2009. The emissions were estimated using the 2006 IPCC First Order Decay Model for National Greenhouse Gas Inventories and default values provided by MfE (2016).

Overall the data quality is considered to be robust.

Similarly waste generated by the CCOs is sent to the Rotorua landfill and is therefore included in the overall emissions from the landfill (Scope 1). No recycling information was available for the CCOs.

Note: Landfill gas emissions are difficult to measure directly and as a result are generally estimated using one of two methodologies. National and international reporting is commonly done through a first-order-decay model. This estimates the emissions generated during a specific reporting timeframe. Alternatively landfill gas emissions can also be estimated on the basis of waste that is being sent to landfill during the reporting period using a mass balance approach which estimates the potential emission that may arise from the landfilled waste. IPCC encourages the use of the first-order-decay model which produces more accurate results. The results from the two methods are not comparable.

The emissions from landfill gas for the RLC carbon footprint have been estimated using the first-order-decay model. This relies on a number of assumptions, such as rainfall during the reporting year, temperature, amount of waste sent to landfill, waste composition, methane generation potential, amount of landfill gas captured, etc.

2.2.2 Scope 2 Indirect Emissions

Electricity

Electricity consumption data has been provided through meter readings and Time of Use data. Data is available for electricity usage across the different RLC operated entities including the CCOs. The emission factors for electricity were taken from MfE (2016) for the 2014 calendar year.

2.2.3 Scope 3 Other Indirect Emissions

Purchased Goods and Services (Cat 1), Capital Goods (Cat 2), Upstream Transport & Distribution (Cat 4)

Activity data (based on dollar spend) for these Scope 3 indirect emission sources were extracted from the general ledgers of the Council, Infracore and Rotorua Economic Development. Airport financial data was not available so no Scope 3 emissions are included for the Airport, with the exception of Transmission and Distribution losses (see below). Estimated emissions under these categories were calculated using the Motu (2014) emissions factors for average industry sectors and activities in New Zealand. The quality of this data is considered to be satisfactory.

Transmission and Distribution losses for electricity & gas (Cat 3)

The emissions factors used for T&D losses from electricity and gas consumption from RLC and CCOs are based on national average figures for electricity and natural gas lost in the transmission and distribution network provided by MfE.

Employee Commuting (Cat 7)

Employee commuting data was sourced through a staff survey conducted by RLC during June- July 2018. The response rate for the survey was approximately 40%. This data was used to estimate the GHG emissions associated with employee travel to and from work during the reporting year. However given the survey was undertaken in winter, it is anticipated that active modes would increase in summer.

No employee commuting data was available for the CCOs.

Business Travel- Air Travel

Where available, air travel data has been sourced from the i-Site and a small number of P-Card transactions and reported for “Domestic’, ‘Short Haul International’ and ‘Long Haul International’. The emissions factors applied to this data have been sourced from MfE (2016). In accordance with recommendations from MfE, an uplift factor of 9% was added to all airline travel. This is to compensate for indirect flight routes, circling and delays. While this figure is not likely to be accurate in every situation, it is a conservative approach in the absence of more specific information. Emissions associated with a given flight will be dependent on variations in aircraft type, fuels used, weather conditions, flight paths and loads.

The activity data is considered to be satisfactory.

3.0 Results

This section presents the results of the RLC carbon foot printing study. It presents:

- a broad overview covering all of the activities;
- an overview of the corporate emissions, not taking into account the landfill;
- 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.

3.1 All Activities and Scopes

In 2016/17, RLC's carbon footprint is estimated as 103,367 tonnes CO_2e (tCO_2e). Table 3 provides a summary breakdown of all the emissions included in the carbon footprint. The largest source of emissions was the landfill which contributed 93,871 tCO_2e.

Table 3 Rotorua Lakes Council Emissions Inventory Summary

Source	kg CO_2e	% of total	% of Total not including Landfill
Scope 1			
Diesel Generators	39,510	0.04%	0.42%
Gas	207,555	0.20%	2.19%
Fleet Fuel	195,726	0.19%	2.06%
CCO Scope 1 emissions	54,152	0.05%	0.57%
Landfill	93,871,167	90.81%	
WWTP	146,000	0.14%	1.54%
Scope 2			
Electricity	2,954,175	2.86%	31.11%
CCO Scope 2 emissions	135,674	0.13%	1.43%
Scope 3			
Purchased Goods & Services	3,149,233	3.05%	33.16%
Capital Goods	2,045,669	1.98%	21.54%
Fuel & Energy Related Activities	265,302	0.26%	2.79%
Upstream Transportation and Distribution	46,226	0.04%	0.49%
Waste generated in Operations	8,552	0.01%	0.09%
Business Travel	19,586	0.02%	0.21%
Employee Commuting	198,782	0.19%	2.09%
Downstream leased assets	13,398	0.01%	0.14%
CCO Scope 3 emissions	16,189	0.02%	0.17%
Total	**103,366,896**	**100%**	
Excluding Landfill	**9,495,729**		**100%**

The total emissions excluding the CCOs is 103,161 tCO_2e which is 297.1 tCO_2e./ FTE including the landfill emissions and 26.75 tCO_2e/ FTE excluding the landfill emissions.

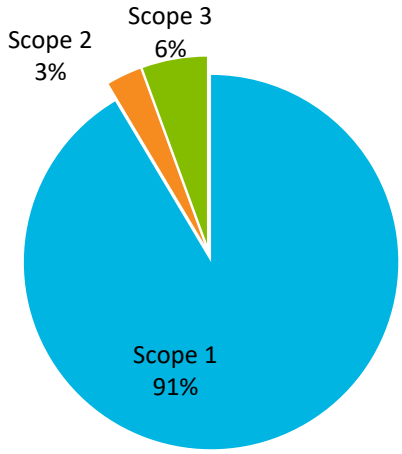

Figure 3 Total Emissions by Scope

Figure 3 shows the breakdown of total emissions by scope of which 94,514 tCO_2e are direct emissions (Scope 1), 3,090 tCO_2e are from electricity indirect emissions (Scope 2) and 5,763 tCO_2e are indirect (Scope 3) emissions.

3.1.1 Scope 1 Direct Emissions

Scope 1 emissions represent the dominant source of emissions, accounting for 91% of the overall footprint. The majority of the emissions come from the Rotorua landfill, which is responsible for 93,871 tonnes CO_2e.

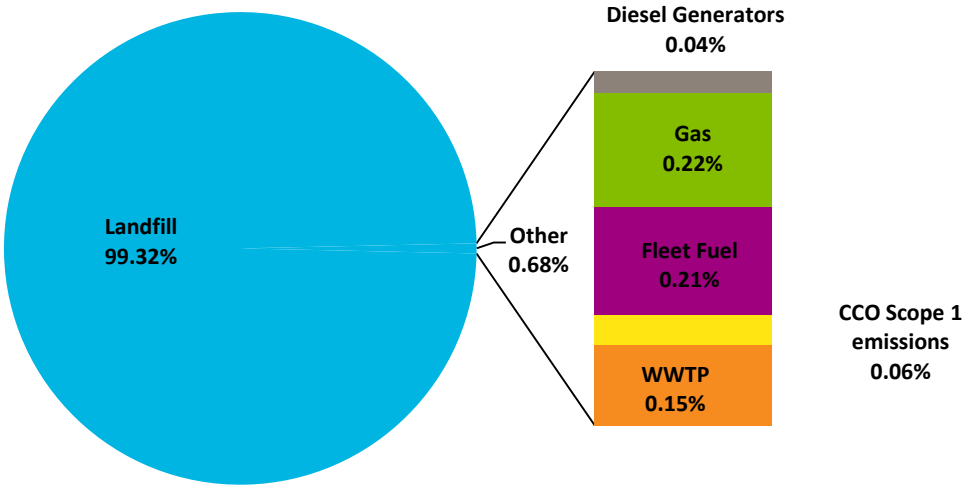

Figure 4 Scope 1 Emissions by Source

Waste (landfill gas) represents the largest Scope 1 emission source (direct emissions) at 99.32% of Scope 1 emissions followed by stationary gas combustion (208 tCO_2e) and fleet fuel combustion (196 tCO_2e) at 0.22%.and 0.21% respectively.

Note:

It is understood that RLC intend to close the landfill in 2018 with an approved consent until 2032. Waste from the Rotorua region is intended to be sent to a more modern design waste facility. Following closure, the landfill will continue to emit methane from decomposing waste and be a significant source of GHG emissions from RLC and its community (included in the community carbon footprint). Advice from the World Resources Institute is that the fugitive emissions from the landfill will continue to be direct emissions (Scope 1) for as long as RLC owns the landfill property. Emissions from closed landfills are not currently included under the New Zealand Emissions Trading Scheme (ETS), but at the time of writing the ETS was under review.

3.1.2 Scope 2 Indirect Emissions

Scope 2 emissions are entirely generated from consumption of grid-supplied electricity, resulting in 3,090 tCO_2e or 2.99% of the overall emissions of RLC.

3.1.3 Scope 3 Indirect Emissions

Scope 3 emissions totalling 5,763 tCO_2e are generated from a number of sources (Figure 5). The largest contributors are the purchasing of goods and services and capital goods required to provide Council services such as consultants, contractors and consumable goods. The library upgrade project undertaken during the reporting period made a significant contribution to the capital goods category.

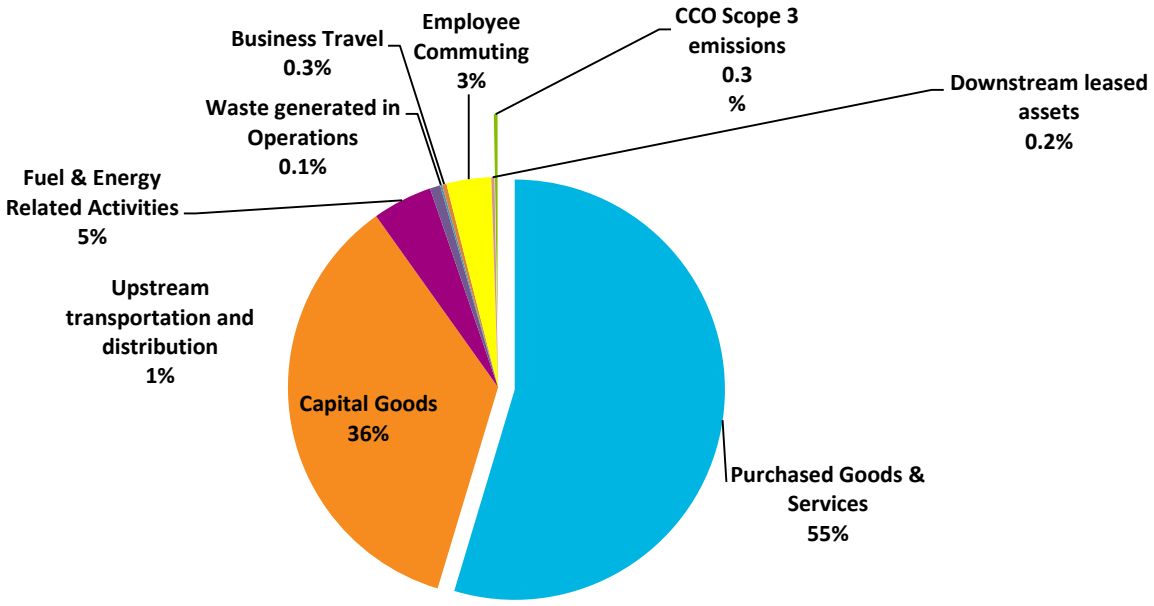

Figure 5 Scope 3 Emissions by Source

3.2 Emissions Summary (excluding Landfill)

The following section provides a breakdown of the emissions excluding emissions from the Rotorua Landfill. This better illustrates the key emissions sources from RLC's remaining operations. The corporate emissions without the emissions generated by the landfill are 9,495 tCO_2e.

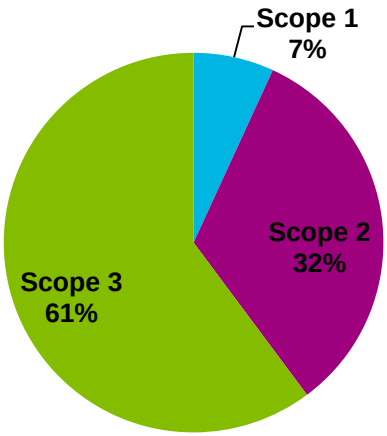

Figure 6 Corporate Emissions (excluding landfill) by Scope

Figure 6 illustrates that the majority of RLC's emissions when the landfill emissions are removed, are Scope 3 emissions, followed by Scope 2 and Scope 1. The main contributors to these emissions are Purchased Goods & Services and Capital Goods in Scope 3, and Electricity in Scope 2.

The Scope 1 emissions are 643 tCO_2e. Figure 7 below illustrates the Scope 1 emissions by activity. Gas consumption for heating, fleet fuel and the WWTP being the main contributors to Scope 1 emissions.

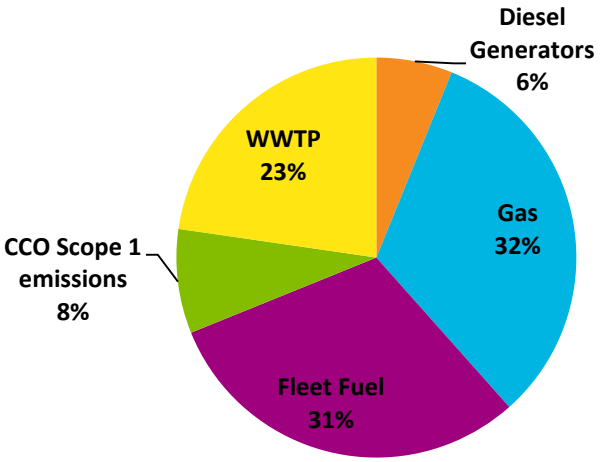

Figure 7 Scope 1 Emissions by Source, excluding landfill

3.3 Results by RLC Activities

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

3.3.1 Electricity Usage

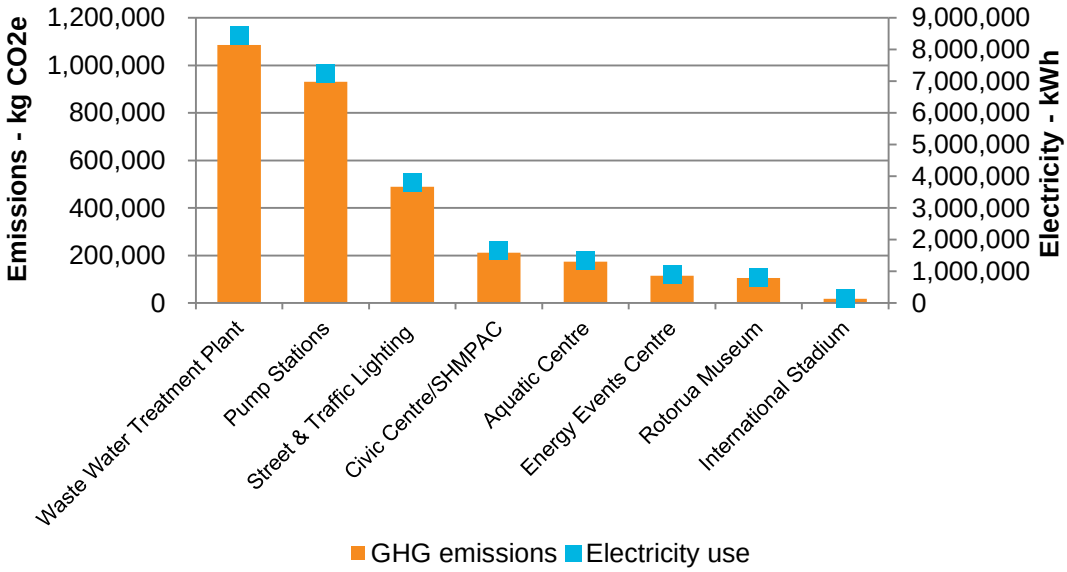

Figure 8 Electricity Emissions by Source

Total electricity emissions are calculated to be 3,193 tCO_2e (including Transmission & Distribution losses). The WWTP and pump stations (sewerage and storm water) are the largest electricity users at 34% and 29% of total electricity use respectively.

3.3.2 Gas Usage

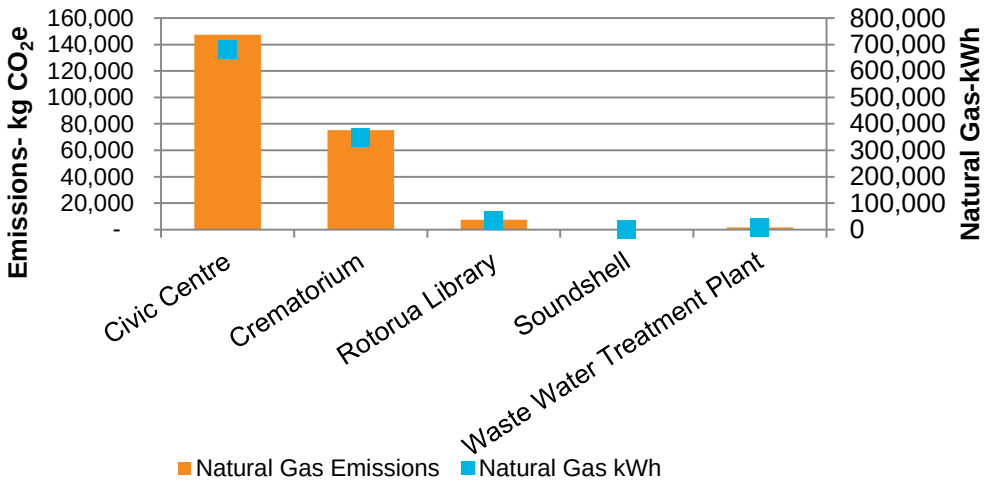

Figure 9 Natural Gas Emissions by Source

Total natural gas emissions are calculated to be 232 tCO_2e with 64% produced by the Civic Centre and 32% by the Crematorium.

The Civic Centre offices changed from natural gas to geothermal heating in the final quarter of the reporting period, which will reduce energy-related emissions in future years.

3.3.3 Transport Emissions

Figure 10Transport-related Emissions per Transport Mode below shows that fleet fuel consumption and employee commuting are responsible for the majority of transport-related emissions.

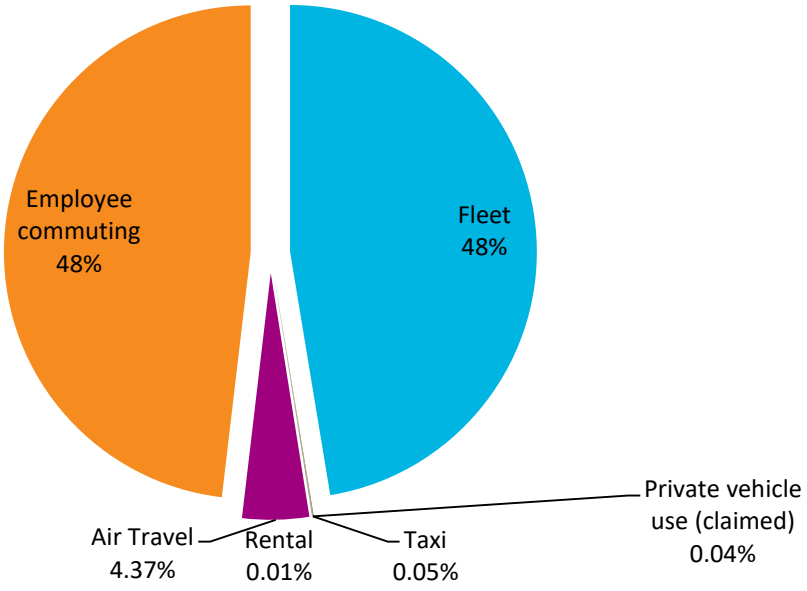

Figure 10 Transport-related Emissions per Transport Mode

Transport emissions include fleet vehicle travel, mileage claims for business travel, air travel, rental cars and taxis, and employee commuting. Fleet fuel and employee commuting are the major contributors to transport emissions at 48% each. All fleet vehicles are either petrol or diesel fuelled.

Commute data is based on an employee travel survey from 2018. The data from the respondents was extrapolated to the total number of FTE's (347) present at RLC in 2016/17.

3.4 Benchmarking

Figure 11 compares the total emissions for the Rotorua Lakes District Council with the emissions reported by Hutt City, Wellington City, Dunedin City and Christchurch City for the 2016/17 reporting period. Rotorua Lakes Council's total emissions are significantly larger than the emissions reported by Hutt City, Dunedin City and Christchurch City and similar to Wellington City's emissions. The main reason for these differences is the amount of landfill gas emissions reported by each of these Councils. Christchurch reported the lowest emissions, as it does not operate any landfills[3] . Hutt City has the second lowest emissions, as its landfill is the most effective at collecting and destroying landfill gas.

All of the landfill gas generated at the Rotorua landfill is emitted into the atmosphere, while Hutt City, Wellington City and Dunedin City landfills collect and destroy the majority of their landfill emissions. For example, the Silverstream landfill in Hutt City receives more than twice the amount of waste than the Rotorua landfill but collects and destroys approximately 90% of the methane generated from the landfill. This reduces the emissions from the landfill from 126,000 tCO_2e to 12,600 tCO_2e per year. A similar reduction in emissions from the Rotorua landfill would reduce the total emissions from Rotorua

[3] CCC has excluded Kate Valley landfill on the basis that the Council has no operational control over the landfill.

Lakes Council from currently 103,000 tCO_2e to about 19,000 tCO_2e, very similar to Hutt City's overall emissions.

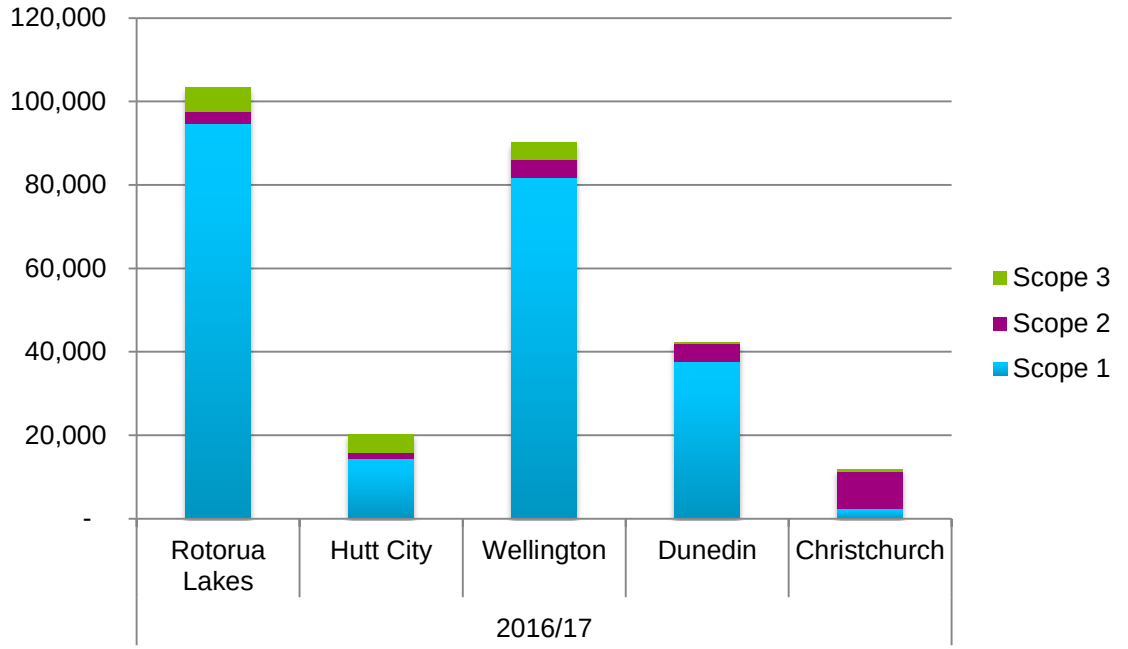

Figure 11 Benchmarking - Total Emissions of selected NZ city councils in 2016/17

Excluding emissions from the landfill, Rotorua Lakes Council's overall emissions are very similar to the emissions reported by Hutt City and Dunedin City Council (see Figure 12 below). Rotorua, Hutt City and Wellington City are also reporting the majority of their Scope 3 emissions, while Dunedin and Christchurch City have excluded some of their Scope 3 emissions, such as emissions generated by contractors, rental car use and staff commuting.

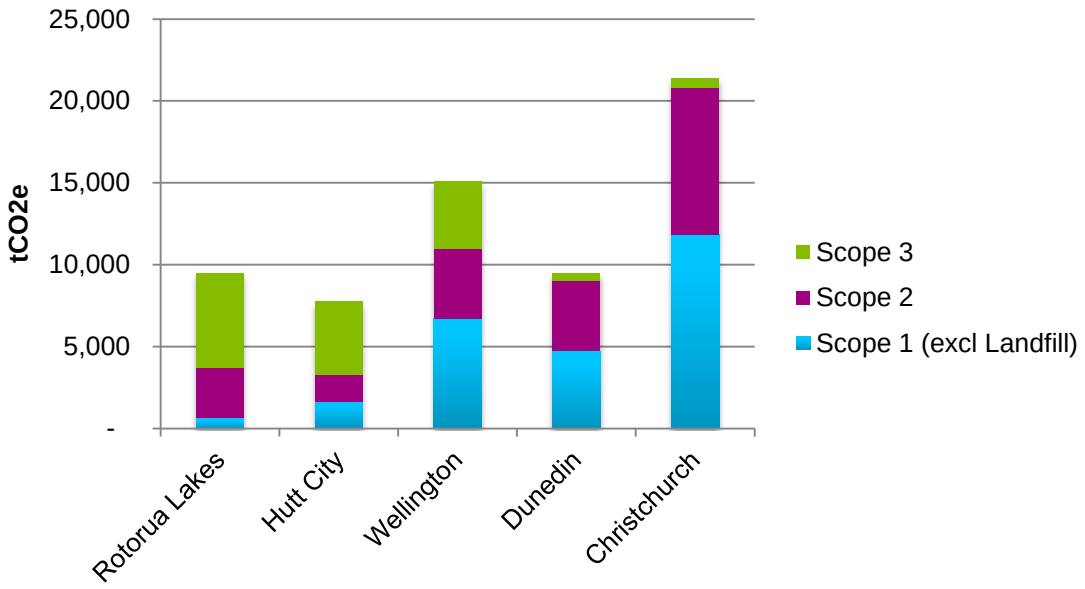

Figure 12 Benchmarking – Total emissions for selected NZ Councils for 2016/17 (excl. landfill emissions)

4.0 Carbon Reduction Opportunities and Recommendations

This section describes a range of carbon reduction opportunities that RLC might consider implementing. In many cases, there will be financial savings or other economic benefits associated with implementing these recommendations.

Appendix B provides a short overview of initiatives other Cities and Councils have successfully implemented internationally to reduce emissions.

LGNZ have recently published a stocktake of Council emission reduction initiatives[4]. The LGNZ document also provides a good summary of potential actions Rotorua can consider to reduce emissions from its own operations and community level emissions.

4.1 Electricity and Gas Consumption

The majority of electricity consumption is from the WWTP and pump stations. We suggest that energy efficiency measures related to the WWTP and pump stations be investigated.

Street and traffic lighting is the next biggest source. Opportunities to convert to LED lighting (if not already implemented) and to implement intelligent management software, e.g. allowing the dimming of streetlights during low use hours, could be investigated.

The majority of the gas is used at the Civic Centre and the crematorium. The Civic Centre building recently switched from natural gas to a closed loop geothermal heating system, so the emissions from heating this building will reduce in the next reporting period. The crematorium could investigate options for increased fuel efficiency or fuel alternatives.

Ultimately any investment in new assets and capital equipment should mandate energy efficiency and low carbon options as key considerations in the decision making and procurement process.

4.2 Vehicle and Fuel Usage

Fleet fuel use is the biggest contribution to Scope 1 emissions after the landfill and gas use. The following options could be explored to reduce fuel consumption:

- Transition fleet vehicles to electric vehicles (EVs) or other fuel or transport alternatives to reduce fossil fuel use.
- Undertake feasibility investigations of transitioning diesel vehicles to a biodiesel blend to reduce the carbon intensity of the diesel fleet.
- Consider opportunities for driver efficiency through training and behavioural programmes.
- Undertake a fleet analysis to provide a baseline for decision-making and contribute to the above.
- Run alternative travel days, promote EVs and hybrids to employees and/or develop a corporate travel plan to reduce emissions related to commuting.

4.3 Landfill emissions

RLC does not currently capture the landfill gas at the Rotorua Landfill, which represents over 90% of the total emissions reported by the Council. The national average for landfill gas capture is 68%. We highly recommend investigating the following opportunities to reduce landfill gas emissions:

- Install a flare to destroy methane

4.4 Emission reduction targets and action plan

A number of councils have recently set emission reduction or carbon neutral targets, as shown below. Partly this is driven through participation in the Global Covenant of Mayors for Climate and Energy as

[4] http://www.lgnz.co.nz/assets/Uploads/46628-LGNZ-Summary-of-Emission-Reduction-7-Proof-FINAL.pdf

well as a response to central government's indication to move to a net zero or low carbon economy in the second half of this century.

Christchurch City Council has recently set a new target to reduce its organisational CO_2 emissions to net zero by 2030, while Dunedin City has set a city-wide target (i.e. not just council operations) to reduce its CO_2 emissions to net zero by 2050.

Auckland Council is currently revisiting its low carbon action plan and emission reduction targets but previously set a reduction target of 40 percent by 2040.

Wellington City Council has set the following targets for the citywide emissions reduction plan. The base year for the city is 2000/01:

- 2020: 10% reduction from 2001 levels
- 2030: 40% reduction from 2001 levels
- 2040: 65% reduction from 2001 levels
- 2050: 80% reduction from 2001 levels.

The carbon footprint presented in this report provides RLC with a baseline for decision-making, engagement and action. The carbon footprint results are a valuable tool for engagement with Council staff, suppliers and other stakeholders. They also provide the means for creating a focused roadmap linking ambitious future targets and current practices and activities.

4.5 Sustainable Procurement

Excluding emissions from landfill operations, the majority of emissions are generated from electricity generation (discussed above), purchased goods and services and capital goods. These indirect emissions are generated via operational, maintenance and construction contracts. These emissions have been estimated based on average industry data and emissions reported by Motu (2014).

We recommend more robust use of sustainable procurement policies and guidelines to select relevant providers and to require larger contract providers to estimate and report their Scope 1 and Scope 2 emissions (at a minimum) and demonstrate their reduction performance.

4.6 Improved Data Quality

The following actions related to data collection could improve the accuracy of subsequent footprints:

- Collect information on air-conditioning and chiller units including refrigerant type, charge and a record of refrigerant top-ups (maintenance) so that fugitive emissions from these can be calculated and included in the boundary.
- Collect travel data for the CCOs by kilometre and travel mode, or at least spend data broken down by travel mode.
- Collect fuel use data for the airport.
- Collect balance sheet information for the airport to incorporate into scope emissions.
- Measure recycling and waste data.
- Undertake a travel survey during summer months to determine whether active modes of transport increase.

5.0 References

5.1 Carbon footprint calculations

DEFRA (2017) DEFRA (2017) UK Government GHG Conversion Factors for Company Reporting

MfE (2016) - Guidance for Voluntary Greenhouse Gas Reporting – 2016: using data and methods from the 2014 calendar year, Ministry for the Environment, Wellington, New Zealand

MfE (2018) - Ministry for the Environment, New Zealand's Greenhouse Gas Inventory 1990-2016, Ministry for the Environment, Wellington, New Zealand

Motu (2014) - Greenhouse Gas Emissions in New Zealand: A Preliminary Consumption-Based Analysis, Motu Working Paper 14-05, Motu Economic and Public Policy Research, Wellington New Zealand.

Pers.Comm, 28/9/2018, Cynthia Cummis, World Resources Institute.

StatsNZ (2018) Population estimates - NZ.Stat table viewer, Statistics New Zealand, Wellington, New Zealand

World Resources Institute and World Business Council for Sustainable Development (2004), The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard, Revised Edition, USA.

World Resources Institute and World Business Council for Sustainable Development (2011), Corporate Value Chain (Scope 3) Accounting and Reporting Standard, USA.

5.2 Council targets

Christchurch City Council Target

https://ccc.govt.nz/news-and-events/newsline/show/2175

Wellington Targets

https://wellington.govt.nz/services/environment-and-waste/environment/climate-change/greenhouse-gas-emission-reduction-targets

Dunedin Council Target

http://www.dunedin.govt.nz/your-council/council-projects/waste-futures/carbon-emission-reduction

6.0 Glossary

Carbon Dioxide Equivalent (CO_2e)	A standard unit for measuring carbon footprints. 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's GWP.
Carbon Footprint	A measure of the amount of GHGs emitted by a particular organisation. Typically expressed in terms of CO_2e, and for a 12 month reporting period.
Emission Factor	A metric that converts a specific emission source - such as a litre of diesel - in terms of CO_2 or CO_2e.
Global Warming Potential	A measure of a gas's ability to cause radiative forcing in the atmosphere (or global warming) relative to the ability 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	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	This standard provides guidance for companies 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 RLC, 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 RLC.
Scope 3 Emissions	An optional reporting category that covers all other indirect emissions. These emissions are a consequence of RLC's activities, but occur from sources it does not own or control. Examples include the embodied carbon in materials and air and taxi travel.

7.0 Limitations

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Appendix A

Data quality

Appendix A Data quality

Data Quality

The table below describes the data quality indicators used in the above sections. Explanations of these terms are provided below.

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 prorated on previous results, use of precedents or historical data, or even a calculated guess.

Robust = Evidence of sound, mature and correct reporting system, where room for error is negligible. Examples would include use of 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.

Appendix B

Examples of International Emission Reduction Targets and Initiatives

Appendix B Examples of International Emission Reduction Targets and Initiatives

Table 4 outlines the emission reductions achieved by selected cities internationally and their long term targets. Table 5 outlines some of the emission reduction initiatives implemented by cities reviewed as part of this project. The majority of cities reviewed report their emission reductions on a community level, and hence many of the emission reduction initiatives are focused on reducing the emissions generated within the city boundary, e.g. from transport or energy generation. However, many of emission reduction initiatives listed here will be applicable to Rotorua Lakes District Council.

Table 4 Emission Reductions and Targets for selected cities internationally

City	Base Year emissions	Current year emissions (most recent report)	% Emissions Reduction	Targets	Notes
Portland, Oregon. US	FY 2006-07	2016-17	46%	53% reduction below 2006-07 levels by 2030. 80% reduction by 2050, based on 1990 levels	Case studies of reduction initiatives provided in this reference
Adelaide, Australia	2007	2013	20%	Net zero emissions from operations by 2020	Range of actions and benefits listed
Montreal, Canada	1990	2014	23%	30% reduction based on 1990 levels, by 2030. 80% reduction by 2050	
Freiburg, Germany	1992	2014	30%	50% reduction by 2030 and zero by 2050	
Berlin, Germany	1990	2014	32%	40% reduction by 2020, 60% reduction by 2030 and 85% reduction by 2050	
London, Ontario. Canada	2007	2017	64%	10% reduction in overall annual energy use by 2020, based on 2014 levels.	Reduction in commodity emissions. Not including landfill emissions

Table 5 Emission reduction initiatives by sector

Sector	City	Activity	Emissions reduced	Base Year	Reduction time frame
Energy	London, Ontario. Canada	Energy efficiency	Overall, 10% reduction in energy use. Energy efficiency accounts for about 25% of energy emissions reduction- WWTP sludge incinerator reduced natural gas emissions.	2014	2007- 2017
	London, Ontario. Canada	Building energy use	Building energy use per person has decreased by 19%	2014	2007- 2017
	London, Ontario. Canada	Change to LED's	Streetlights energy use per person decreased by 21%.	2014	2007- 2017
	Adelaide, Australia	Reduction in energy use	Council's energy use reduced by 15.5% between 2009/10 and 2014/15.	1994	2009/2010-2014/2015
	Adelaide, Australia	Renewable Energy Purchase	Council purchased 3.6% of its electricity as accredited Green Power in 2014/15, and 19% in 2013/14,	1994	2009/2010-2014/2015
	Adelaide, Australia	LED Public lighting retrofit	Retrofitted 1,476 public lights. Total energy and carbon emissions reduction of 1,546,980 kWh's and 959 tonnes of CO2-e.	1994	2009/2010-2014/2015
	Freiburg, Germany	Smart Traffic light controls	Reductions not reported	1992	2014
Waste	Montreal, Canada	Improved monitoring of landfill biogas emissions	78% reduction in emissions from waste	1990	1990-2014

Sector	City	Activity	Emissions reduced	Base Year	Reduction time frame
WWTP	London, Ontario. Canada	Various activities	Wastewater treatment energy use per person has decreased by 27%	2014	2007- 2017
	Portland, Oregon. US	Water conservation (reduction in electricity used to pump water)	Reductions not reported	2006	2006/07-2016/17
	Portland, Oregon. US	267.4kW system to power Groundwater pump station	Reductions not reported	2006	2006/07-2016/17
Fleet	London, Ontario. Canada	Fleet energy use	Vehicle fleet energy use per person decreased by 9%	2006-07	2007-2017
	Portland, Oregon. US	Fleet emissions reduction overall	23% reduction	2006-07	2006/07-2016/17
	Portland, Oregon. US	Fleet-efficient vehicles. Right size of vehicle for the job.	Exact reduction amount not reported.	2006-07	2006/07-2016/17
	Portland, Oregon. US	Emissions control devices on new diesel vehicles	Exact reduction amount not reported.	2006-07	2006/07-2016/17
	Portland, Oregon. US	Fleet electrification	80-125 vehicles.	2006-07	2006/07-2016/17
	Portland, Oregon. US	Electric vehicle infrastructure	50 electric charging stations	2006-07	2006/07-2016/17