



**Wellington City Council  
Greenhouse Gas Emissions Analysis and Forecast**

**Milestone One Report  
Communities for Climate Protection™ - New Zealand Programme**

# 1. Wellington City Council Greenhouse Gas Emissions Analysis and Forecast

## 1.1 Executive Summary

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In August 2004, Wellington City Council joined the Communities for Climate Protection™ - New Zealand (CCP™-NZ) Programme, a campaign to reduce greenhouse gas emissions. CCP™-NZ is a New Zealand Government initiative delivered by the International Council for Local Environmental Initiatives – Australia / New Zealand (ICLEI-A/NZ). This programme is part of ICLEI's International Cities for Climate Protection™ Campaign.

Milestone 1 of the CCP™-NZ Programme requires participating councils to conduct an analysis and forecast of greenhouse gas emissions from the community and from Council activities. The New Zealand Climate Change Office of the Ministry for the Environment provided \$4,000 for Council to employ an intern to assist with this task. Council also established a process for gathering and storing data for performing future inventories within Council.

The analysis and forecast of greenhouse gas emissions been completed for Wellington City Council and this report details the results.

Key findings identified from the inventory process are:

- The CCP™-NZ Programme divides local authorities' greenhouse gas emissions into two areas: Corporate (referring to Council activities), and Community (the residential, commercial and industrial sectors of the Council area).
  - The base year for the Corporate Inventory is 2003 and the greenhouse gas emissions for Council in 2003 were 12,577 tonnes of carbon dioxide equivalents (CO<sub>2</sub>e). In a business as usual scenario, where no action is taken, these emissions are expected to rise by 3.3% or 13,000 T-CO<sub>2</sub>e by 2010.
  - The base year for the Community Inventory is 2001 and the greenhouse gas emissions for the Wellington community in 2001 were 1,078,793 T-CO<sub>2</sub>e. In a business as usual scenario, where no action is taken, these emissions are expected to rise by 11.3% in 2010.
  - Key sources of greenhouse gas emissions from Council's operations include electricity in Council buildings and operations and natural gas for heating swimming pools.
  - Key sources of greenhouse gas emissions from the Wellington community include petrol and diesel use in the transport sector and electricity in residential, commercial and industrial activities.

## 1.2 Background

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CCP™-NZ is a New Zealand Government initiative delivered by the International Council for Local Environmental Initiatives – Australia/ New Zealand (ICLEI-A/NZ). This programme is part of ICLEI's International Cities for Climate Protection™ Campaign.

CCP™-NZ encourages and supports councils to reduce their greenhouse gas emissions and develop actions to foster climate change action at a local level. There are almost 700 Councils participating in the CCP™ Programme around the world, including twelve New Zealand councils.

Wellington City Council joined the CCP™-NZ Programme on 18<sup>th</sup> August 2004 and committed to completing the five milestones of the Programme. These are:

- *Milestone 1:* Conduct an inventory and forecast for Community and Corporate (Council) greenhouse gas emissions
- *Milestone 2:* Establish a greenhouse gas emissions reduction goal
- *Milestone 3:* Develop and adopt a local action plan
- *Milestone 4:* Implement the local action plan and quantify the benefits of implementing actions
- *Milestone 5:* Monitor and report on implementation of the local action plan and progress towards achieving the reduction goal.

The milestone framework enables Council to strategically identify sources and levels of greenhouse gas emissions produced from within Council's operations ('corporate') and the community. Council has completed Milestone 1 and can now use the results to prioritise actions to reduce greenhouse gas emissions that are locally relevant.

## 2. WELLINGTON CITY COUNCIL CORPORATE EMISSIONS ANALYSIS

### 2.1 Overview

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The base year selected by Wellington City Council for the corporate emissions inventory was the 2003 calendar year for Buildings, Streetlights, and Water/Sewage sectors, and the Vehicle Fleet sector is based on the 2003/2004 financial year. These timeframes were selected due to the availability of data necessary to complete the inventory. The Waste sector data is currently being compiled so is not reported on in this analysis.

The forecast year is 2010. This is recommended by ICLEI-A/NZ and is the mid-point of the First Commitment Period of the Kyoto Protocol. The forecast calculations are based on a 'business as usual' scenario for Council's operations. This includes taking into account energy consumption for the following projects that occur between the base year and the forecast year:

All greenhouse gas emissions are equated into a common measure of CO<sub>2</sub>e in tonnes (T). CO<sub>2</sub>e is a measure of *equivalent* carbon dioxide produced from each emissions source. For example, methane is 21 times more potent than carbon dioxide in terms of global warming potential. Therefore, 1 tonne of methane is calculated to be the equivalent of 21 tonnes of CO<sub>2</sub>, and is expressed as 21 T-CO<sub>2</sub>e.

The greenhouse gas emissions for Council in 2003 were 12,577 T-CO<sub>2</sub>e.

### 2.2 Breakdown of Corporate Analysis

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The corporate emissions analysis is broken down into six main sectors:

- **Buildings** – emissions resulting from the energy use (electricity and gas) of Council owned and/or operated buildings
- **Streetlights** – emissions resulting from the energy use of streetlights and traffic signals.
- **Vehicle Fleet** – emissions resulting from the energy use (petrol, diesel and LPG) of Council-operated vehicles and machinery
- **Employee Commute** – a non-compulsory sector which examines emissions resulting from the energy use (petrol, diesel and LPG) of Council employees travelling to and from the workplace in personal vehicles.

- **Water and Sewage** – emissions resulting from the energy use (fuel and electricity) by the buildings and equipment used for pumping and treatment of water and sewage by facilities owned/operated by Council.
- **Waste** – emissions resulting from the breakdown of organic waste originating from corporate activities and operations (organic waste breaks down to produce methane) yet to be completed.

## 2.3 Corporate Emissions Breakdown by Sector

The major source of emissions is from the Building sector, followed by Vehicle Fleet and Streetlights. Corporate waste and employee commute data are not included in the breakdown but the data will be added to this breakdown in the near future. Neither is expected to contribute more than 3% of Council's total corporate emissions. Contractors to Council are not included in the inventory because of lack of valid information.

Figure 1 below shows the percentage of corporate emissions produced from each of these sectors during the inventory time period. The Building, Streetlights, and Water/Sewage sectors are based on the 2003 calendar year, and the Vehicle Fleet sector is based on the financial year, 1 July 2003 to 30 June 2004.

**Figure 1 - Wellington City Council Corporate Emissions by Sector**

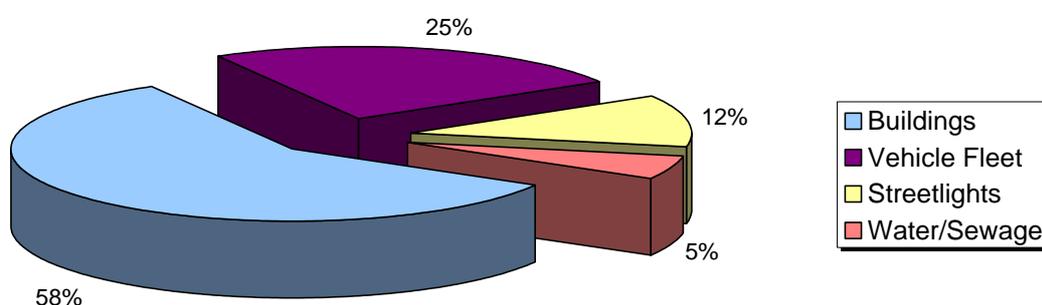


Table 2 below contains the actual emissions data for each sector.

**Table 2 – Wellington City Council Corporate Emissions for 2003**

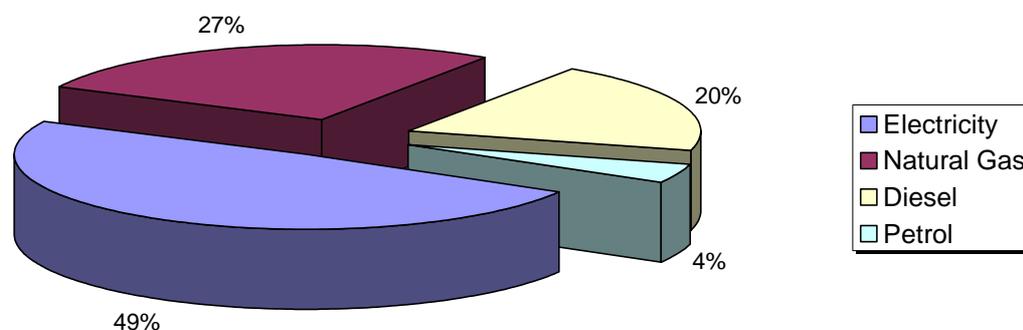
Sectors	Equiv CO <sub>2</sub> (tonnes)	Equiv CO <sub>2</sub> (%)	Energy (GJ)	Cost (\$)
Buildings	7,323	58.2	138,561	3,285,845
Vehicle Fleet	3,127	24.9	46,188	863,678
Streetlights	1,464	11.6	27,452	1,399,775
Water/sewage	663	5.3	12,432	536,585
<b>Total</b>	<b>12,577</b>	<b>100.0</b>	<b>224,641</b>	<b>6,154,604</b>

## 2.4 Corporate Emissions Breakdown by Energy Type

Electricity is the primary source of emissions with 6,164 T- CO<sub>2</sub>e (49%) with natural gas the next biggest contributor with 3,405 tonnes of CO<sub>2</sub>e (27%). As mentioned above, the main use of natural gas is for heating swimming pools, with electricity the source of lighting, heating, cooling, office equipment and water pumping. Note: LPG accounts for less than 0.5% of Council's corporate emissions.

The figure below shows the complete breakdown of corporate emissions by source.

**Figure 2 - Wellington City Council Corporate Emissions by Source**



## 2.5 Emissions from Council Buildings

Buildings produce 58.3% (7,323 T-CO<sub>2</sub>e) of Council's emissions (3,918 tonnes CO<sub>2</sub>e from electricity and 3,405 tonnes CO<sub>2</sub>e from natural gas). Council Controlled Organisations (Positively Wellington Tourism, St James Theatre Trust, Museums Trust, Wellington Waterfront and Wellington Zoo) are included in the total figure, contributing 933 tonnes of CO<sub>2</sub>e or 6.8% of total emissions. The table below details the ten largest emitters from the building sector:

**Table 3 – Top Ten Emitters for Building Sector**

Site Name	Equiv CO2 (tonnes)	Equiv CO2 (%)	Cost (\$)
1. Wellington Regional Aquatic Centre	1,288	10.2	358,043
2. Civic Complex (CAB Building)	738	5.9	407,349
3. Karori Pool	492	3.9	167,131
4. Freyburg Pool	460	3.7	125,520
5. Tawa Swimming Pool	424	3.4	137,595
6. MOB Building	387	3.1	166,155
7. Wellington Central Library	310	2.5	62,780

8. Queens Wharf Events Centre	292	2.3	159,961
9. Wellington Town Hall	231	1.8	106,353
10. Michael Fowler Centre	221	1.8	78,725
<b>TOTALS</b>	<b>4,843</b>	<b>38.6</b>	<b>1,753,017</b>

- The sites above account for 38.6% of all of Council's corporate emissions.
- Swimming pools account for 23.9% of all of Council's corporate emissions or 3,003 T- CO<sub>2</sub>e.
- The buildings in civic square (CAB, MOB, Town Hall, Michael Fowler Centre, Wellington Central Library and the city gallery) account for 16.0% of Council's corporate emissions or 2,016 T- CO<sub>2</sub>e.

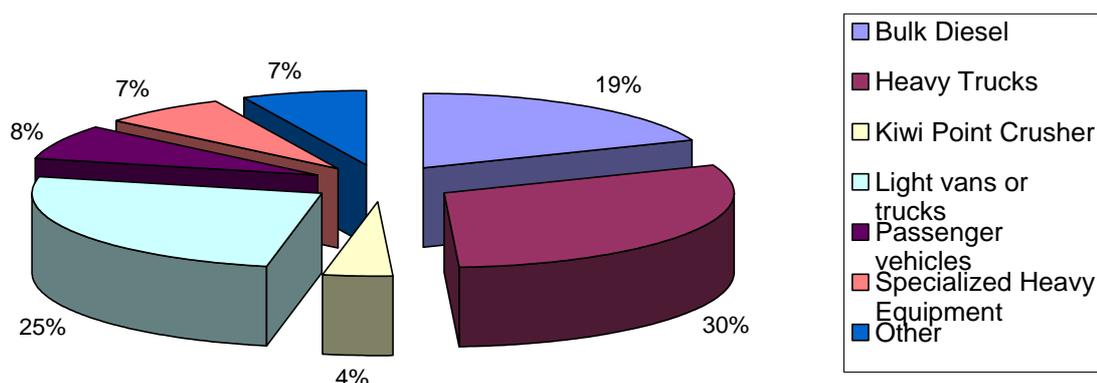
## 2.6 Emissions from Council Street-lighting

The street-lighting sector produced approximately 1,464 T-CO<sub>2</sub>e in 2003 or 11.6% of Council's total corporate emissions. The street-lighting sectors differs from other sectors in that 80% of \$1.4 million street-lighting bill goes to line charges and 20% goes to consumption charges.

## 2.7 Emissions from Council's Vehicle Fleet

The vehicle fleet produce around 3,127 T-CO<sub>2</sub>e in 2003, which is 24.9% of Council's total emissions. The light and heavy trucks make up 55% of the emissions from the vehicle fleet – 25% and 30% respectively. Passenger vehicles only constitute 7% of emissions from the vehicle fleet. The bulk diesel from the landfills represents 19% of the emissions from the vehicle fleet. The figure below shows the percentage breakdown of emissions by the various vehicle types.

**Figure 3: % Breakdown of Emissions from Vehicle Fleet**



The Vehicle Fleet includes bulk fuel purchases that are not associated with specific vehicles. The Kiwi Point Crusher, a piece of crushing machinery at the quarry, runs on electricity and is classified under Vehicle Fleet. It accounts for 9% of the CO<sub>2</sub>e.

## 2.8 Emissions from Council's Water and Sewage Pumps

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The Water and Sewage sector is responsible for 5.3% (663 tonnes CO<sub>2</sub>e) of Council's emissions. Council operates 116 water and sewage pumps and all are powered by electricity. The table below details the ten largest emitters from the water and sewage sector:

**Table 4- Top Ten Emitters for Water and Sewage Sector**

Site Name	Equiv CO2 (tonnes)	Cost (\$)
Epuni Street Pump	158	92,298
434 The Esplanade, Island Bay	47	40,097
Chapman Street Pump	47	20,058
Hay Street Pump	38	30,711
Russel Street Pump	36	25,537
Broderick Street Pump	34	23,193
Townsend Road, Miramar	25	20,016
Wakefield Street – Michael Fowler Centre	15	13,240
Rajkot Terrace, Khandallah	14	12,092
151 Featherston Street, Te Aro	11	9,803
<b>TOTALS</b>	<b>425</b>	<b>287,045</b>

The ten pumps above account for 64% of CO<sub>2</sub>e emissions produced by the water and sewage sector.

## 2.9 Employee Commute Survey

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An employee commute survey was undertaken during January/February 2005 via an internal online questionnaire. The results are currently being compiled and analysed to determine staff vehicle emissions.

## 2.10 Waste

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Council does not collect data relating to the amount of waste it produces through its own operations. Officers are currently reviewing ways in which Council can collect this type of data.

## 2.11 Corporate Emissions Forecast

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The population increase was calculated using the meridian growth variant for 2011 and adjusted by reducing it by one year. The Wellington population is expected to increase by 3.45% from 2003 to 2010 (178,100 in 2003 to 184,138 in 2010). The main areas of increasing greenhouse gas emissions are estimated to come from electricity consumption from Council's building and street-lighting sectors. Other sectors remain relatively constant through time. There is minimal change in vehicles numbers, no new or proposed swimming pools and increase in street and building lighting is on the same trajectory as population growth. Therefore, the overall increase can be attributed to a combination of population growth in the municipality creating growth within the Council staff and associated services, and major construction projects increasing energy consumption.

### Consumption Increases

- i. Queens Wharf Events Centre Upgrade. The first phase is currently in progress and the second stage is to be conducted during 2005/2006, increasing capacity by 0.857 percent, adding approximately a further 50 tonnes of CO<sub>2</sub>e.

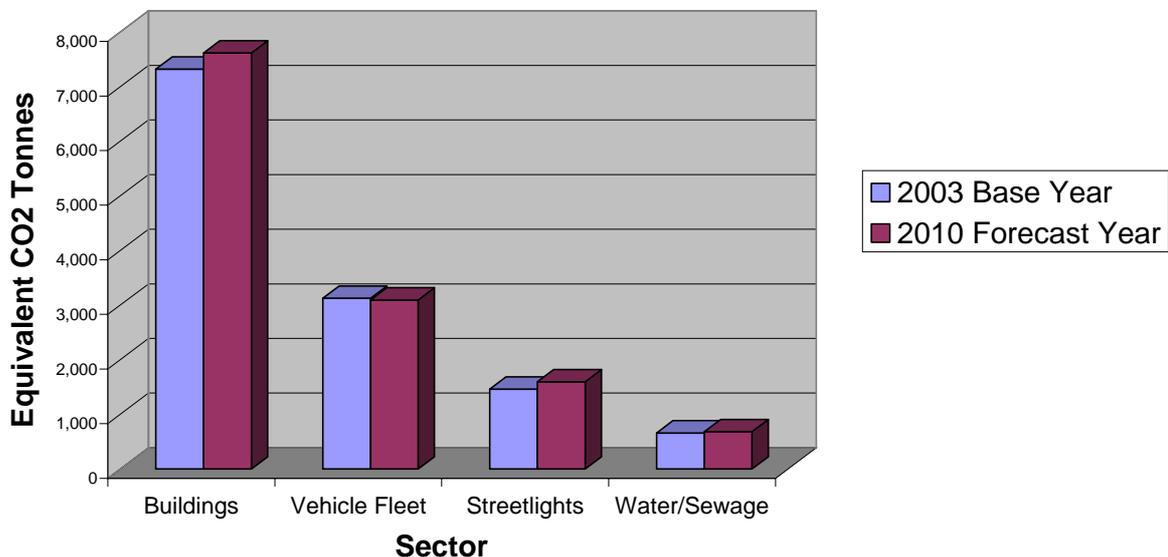
- ii. Construction of Waitangi Park (mid 2005-2006). Increasing lighting and facilities in an area similar to Frank Kitts Park and Taranaki Wharf, which emit 51 tonnes CO<sub>2</sub>e and 964 GJ of energy.
- iii. Construction of Karori Library and Community Centre. Similar in size to the Mervyn Kemp Library and Karori Community Hall, emitting 50 T-CO<sub>2</sub>e and 931 GJ of electricity.
- iv. Newlands Community Facility, 975 m<sup>2</sup>, similar to Karori Community Hall, emitting 17 T-CO<sub>2</sub>e and 314 GJ of electricity.
- v. The electricity consumption for street lighting has increased 1.2% over the past three years. Given that, it is predicted the street-lighting electricity consumption will increase by 8.9% by 2010.
- vi. Construction of CitiOperations building at Southern Landfill (cancelled out by termination of building lease for current site– see below).
- vii. One new public toilet per annum from 2005/06 creating 2 T-CO<sub>2</sub>e and 35 GJ of electricity.
- viii. Construction of indoor sports stadium.

**Consumption Decreases**

- i. Sale of James Smith and Marion St car parks, reducing emissions by 281 tonnes of CO<sub>2</sub>e and 2293 GJ of energy.
- ii. Termination of CitiOperations building lease on Torrens Street.
- iii. The closure of the Northern Landfill will reduce Council’s net consumption of diesel used for landfill operations in Wellington City. The Southern Landfill will receive more pressure from the closure but the amount of diesel should be reduced by 60%.

As Figure 4 and Table 1 illustrate, Corporate emissions are expected to increase under a ‘business as usual’ scenario by 3.4%. The forecast was calculated using a combination of projected population increase in Wellington City, and planned capital works by Council.

**Figure 4 - Wellington City Council Corporate Emissions for Base & Forecast Years**



**Table 1. Base Year and Forecast Year corporate greenhouse gas emissions by sector.**

<b>Sector</b>	<b>Year 2003 (Equivalent CO2 Tonnes)</b>	<b>Year 2010 (Equivalent CO2 Tonnes)</b>
Buildings	7,323	7,619
Streetlights	1,464	1,599
Vehicle Fleet	3,127	3,096
Water	663	686
<b>TOTAL</b>	<b>12,577</b>	<b>13,000</b>

It is worth noting that energy consumption during 2003 is assumed to be lower than usual due to the energy crisis and subsequent power saving, so it is possible that these figures are slightly on the low side.

The Vehicle Fleet Manager at Council believes that the fleet will not vary a great deal, if any, over the next five years, and has changed very little over the last five years. If anything, the fleet size may have reduced slightly.

The electricity figures for 2003 from Meridian Energy were provided by hard copy invoices, while figures for 2004 were taken off the Meridian online support site and assumed to be as accurate as invoice data.

### **3. WELLINGTON CITY COUNCIL COMMUNITY EMISSIONS ANALYSIS**

#### **3.1 Overview**

The base year selected by the Wellington City Council for the community emissions inventory was 2001. The primary reason for selecting 2001 is attributable to most of the data being supplied for the community inventory by ICLEI-A/NZ. The Wellington community produced 1,078,794 T- CO<sub>2</sub>e in 2001.

ICLEI-A/NZ obtain the data primarily from sources such as Statistics New Zealand and the Ministry for Economic Development, who in turn base most of their research on information provided in the last census of 2001. The forecast year is again 2010. Forecast calculations are based on a 'business as usual' scenario allowing for population growth within the city and its associated effects.

The community analysis is divided into five sectors:

- **Residential** – emissions resulting from household energy use across the Wellington City
- **Commercial** – emissions resulting from commercial operations including government and institutional activity (schools, hospitals, etc.) as well as commercial and personal services (retail, finance, etc.)
- **Industrial** – emissions resulting from energy in local industry operations (manufacturing, mining, construction, etc.)
- **Transport** – emissions resulting from energy use associated the movement of people and goods within the Wellington City
- **Waste** – emissions resulting from the breakdown of waste originating from the community.

It is anticipated that agriculture will become another sector in the community emissions analysis, including emissions resulting from stock, cropping and other agricultural activities. However, this has not yet been finalised by ICLEI-A/NZ as a CCP™-NZ sector, and may be taken into account in future inventories.

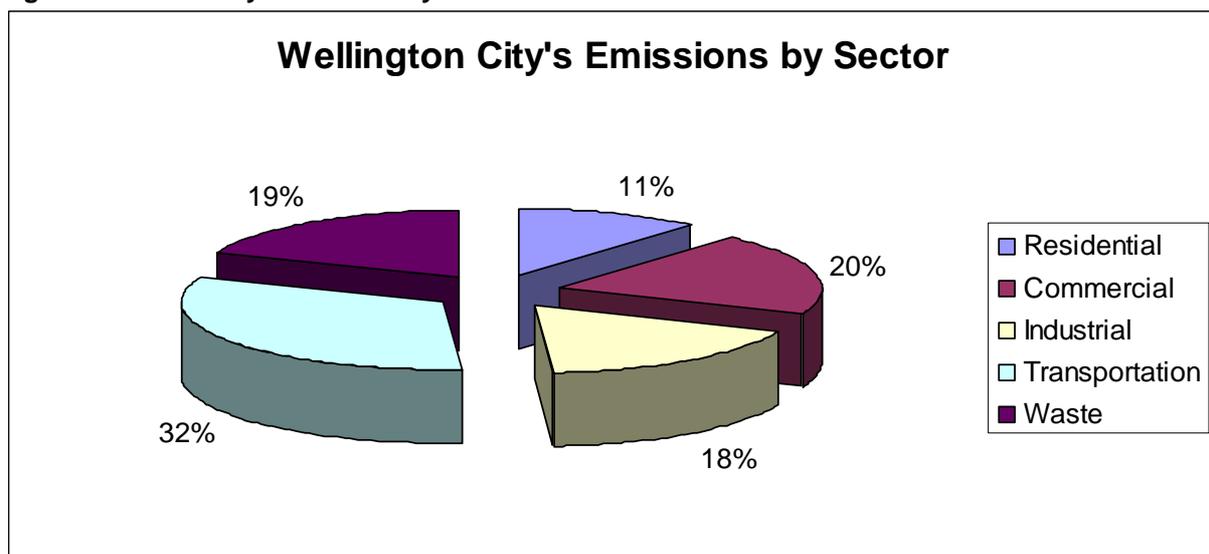
### 3.2 Community Emissions by Sector

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The percentage breakdown of the five sectors is relatively balanced. The transportation sector accounts for 32% of community greenhouse emissions (345,811 T-CO<sub>2</sub>e) and the commercial sector is second accounting for 20% of emissions (214,806 T-CO<sub>2</sub>e). The residential sector produces the least amount of community emissions accounting for 11% (122,285 T-CO<sub>2</sub>e).

Figure 4 shows the complete percentage breakdown of Community greenhouse gas emissions produced from each sector.

**Figure 4: Community Emissions by Sector**



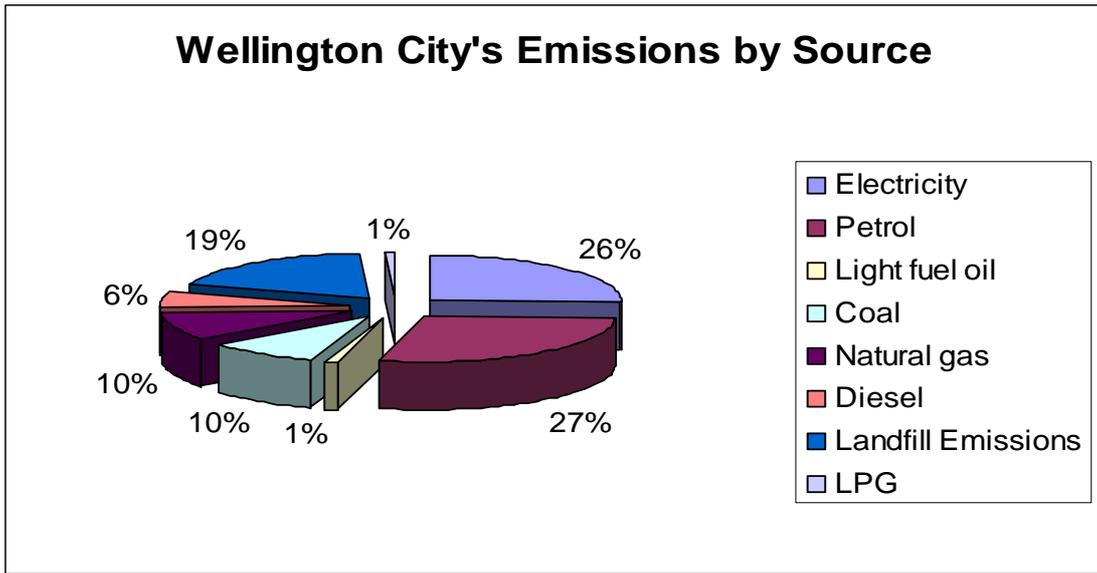
### 3.3 Community Emissions by Source

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It is estimated that petrol accounts for the highest source of community greenhouse emissions with 27% (306,843 T-CO<sub>2</sub>e) closely followed by electricity with 26% (275,734 T-CO<sub>2</sub>e). Landfill emissions account for an estimated 19% (204,802 T-CO<sub>2</sub>e) of greenhouse gas produced in Wellington City.

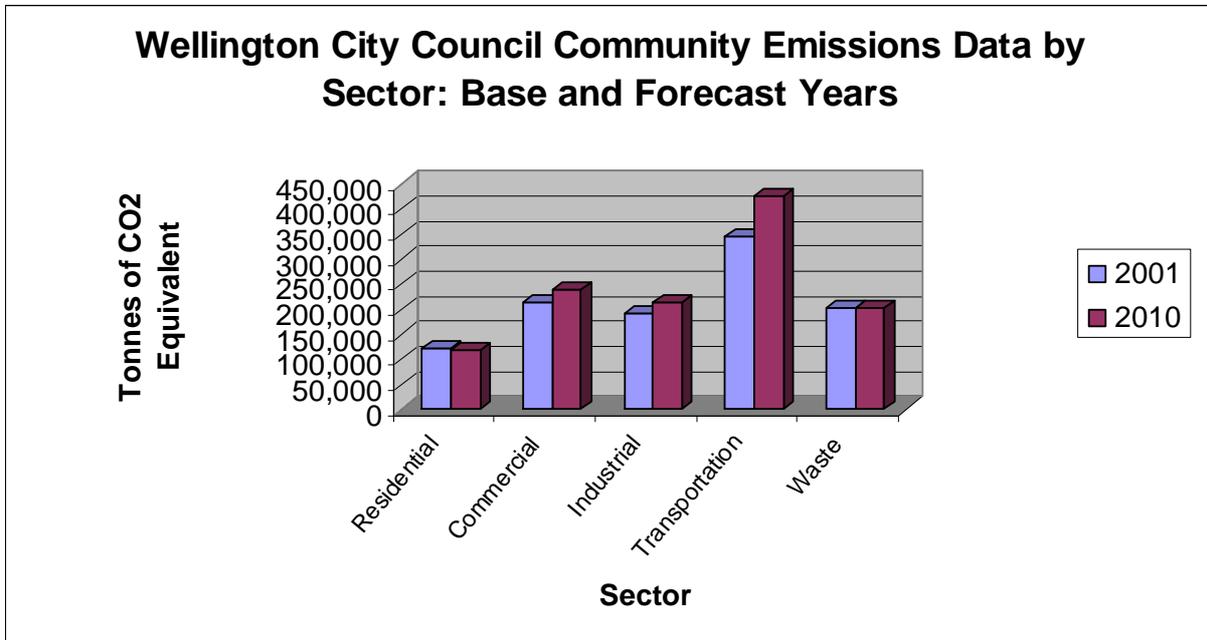
The figure below contains the complete percentage breakdown of greenhouse gas emitted by each source.

**Figure 5: Community Emissions by Source**



### 3.4 Community Emissions Forecast

The overall community emissions are expected to increase under a 'business as usual' scenario by approximately 11%. Transportation is predicted to have a 26% increase in emissions and the Commercial and Industrial are predicted to increase around 10% each. The overall increase can be attributed to population growth in Wellington City, which will lead to increase vehicle numbers and use, as well as the expansion of the industrial and commercial sectors in Wellington.



**Table 2. Base Year and Forecast Year community greenhouse gas emissions by sector.**

<b>Sector</b>	<b>Year 2001 (T-CO<sub>2</sub>e)</b>	<b>Year 2010 (T-CO<sub>2</sub>e)</b>	<b>Percentage Change</b>
Residential	122,285	119,022	-2.7%
Commercial	214,806	238,042	10.8%
Industrial	191,809	214,088	11.6%
Transport	345,811	437,366	26.5%
Waste	204,083	204,083*	---
<b>TOTAL</b>	<b>1,078,794</b>	<b>1,201,601</b>	<b>11.3%</b>

\* Waste is assumed to stay the same until better data can be obtained.

## **Next Steps**

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Council has now completed the requirements of Milestone 1 of the CCP™-NZ Programme and will be beginning / has begun work on Milestone 2 which is developing goals for reducing greenhouse gas emissions. Milestone 3 then requires council to produce a local action plan for how it will work towards those goals. Recommendations for milestones 2 and 3 will be presented to Strategy and Policy Committee in late September.

<p>The views expressed in the document are not necessarily the view of the New Zealand Government or its agencies, and neither the New Zealand Government, its agencies or ICLEI-A/NZ accept responsibility in respect of any information or advice given in relation to, or as a consequence of, anything contained therein.</p>
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