

1.0 Introduction

On November 25, 1998 the Council of the City of Winnipeg committed to support the City's participation in the Partners for Climate Protection (PCP) program. The PCP is a national program partnered by the City of Winnipeg, the Federation of Canadian Municipalities (FCM) and the International Council for Local Environmental Initiatives (ICLEI). The goal of the program is to help municipal governments develop action plans to reduce their greenhouse gas emissions. The five-milestone program allows local governments to understand how municipal decisions effect energy use and how these decisions can be used to mitigate global climate change while improving community quality of life.

2.0 Program Description

The program commits Winnipeg to completing the following five performance milestones:

Milestone 1: Conduct an energy and emissions inventory and forecast

The inventory profiles energy use and GHG emissions for a base year (1994), and estimates growth in emissions for a target year (2010), for:

1. municipal operations, including buildings, facilities, and waste streams;
2. the wider community, including residential and commercial buildings, transportation, and industry.

Milestone 2: Establish an emissions target

Many participants are striving to reduce corporate GHG emissions by 20% below 1994 levels and community wide emissions by 6% below 1994 levels both within 10 years of joining the program.

Milestone 3: Develop and obtain approval for the Local Action Plan

The Local Action Plan, a strategy to reduce GHG emissions, outlines policies and measures the local government will pursue to achieve the emissions target.

Milestone 4: Implement policies and measures

Milestone 5: Monitor and verify results

This is an ongoing step that begins once measures are implemented and is formalized with the approval of the Local Action Plan.

3.0 Milestone 1: Emissions Inventory and Forecast

The purpose of the first milestone was to gather data to profile energy use and greenhouse gas emissions for the base year 1994, and estimate growth in emissions for

the target year 2010. Data for 1998 was also collected for time series and forecasting purposes.

The Inventory consists of two parallel analyses—one for the City of Winnipeg operations and one for the community as a whole. The Cities for Climate Protection (CCP) Greenhouse Gas Emissions Software, which data was entered into, supports all elements of the PCP local action plan – base year inventory, business as usual forecast, reduction target setting, and emission reduction quantification.

4.0 Emissions Inventory Compilation Process

The Partners for Climate Protection Program developed common conventions and a standardized approach to quantifying greenhouse gas emissions. This standardized approach facilitates comparisons between local governments and the aggregation and reporting of the results being achieved by local action plans for greenhouse gas emission reduction.

Data was collected for the City of Winnipeg, following PCP protocols, for municipal operations including buildings, facilities, vehicle fleets and waste streams, and for the community including residential, commercial, industrial, transportation and waste sectors. Once collected, data was entered into the CCP Software; all of the assumptions were noted and all sources were included.

5.0 Policy and Protocol

5.1 Emissions Forecast

The Emissions Forecast is an estimate of the greenhouse gas emissions that would occur in 2010 given “business as usual” conditions. Separate forecasts apply to the community analysis and the corporate analysis.

5.2 Emissions Analysis: Gases that are included

The greenhouse gases measured in the Emissions Analysis are CO₂ from fossil fuel combustion and net greenhouse gas emissions from landfills, after allowing for methane generation and escape, as well as carbon sequestration.

5.3 Emissions Analysis: Gases that are excluded

Nitrous oxide emissions, methane from any sources other than landfill, carbon dioxide from any sources other than fuel and electricity, or any of the other greenhouse gases in the Kyoto Protocol (PFC's, HFC's, SF₆) were excluded. For reference, including nitrous oxide would add about 5-

10% to transportation sector emissions and 1-3% to community-wide emissions.

5.4 Emission Sources that are excluded

Intercity transportation (air, marine, rail, and intercity highway), small engines (i.e. lawn care equipment, off-highway construction equipment and methane from wastewater and sewage sludge) were excluded.

5.5 Electricity/Emissions Coefficients

Manitoba exports significant amounts of electricity, primarily to the United States and Ontario. It also imports a small amount of electricity from the U.S. Electricity imported from the United States is assigned an average U.S. emissions coefficient. The majority of Manitoba's electricity is generated within the province, and is assigned an emissions coefficient based on the province's generating mix (primarily hydroelectric). The final emissions coefficient is a prorated blend of the emissions coefficients of Manitoba and international imports from the United States. Emissions coefficients from these sources are prorated based on their relative contribution to final demand for electricity.

Therefore these coefficients will be much lower in Manitoba, which has a large source of 'clean' hydro power, than in other provinces, such as Alberta, which has a large source of 'dirty' fossil fuel power.

5.6 Public Transit

There is often confusion associated with emissions associated with public transit. Emissions from buses and other transit vehicles were allocated to the community inventory while emissions from transit facilities were included in the corporate analysis.

6.0 Community Inventory Analysis

The following section contains eCO₂ emission breakdowns for the City of Winnipeg for 1994, 1998 and an emissions forecast for 2010. The data within the community inventory are segregated into five sections: residential, commercial, industrial, transportation, and waste. Basic information on energy use and landfilled waste was compiled, and using emission coefficients specifically for Manitoba, the CCP Software calculates the eCO₂ emissions allocated to each sector.

Calculating Emissions

- *Residential/Commercial/Industrial/ Transportation Sector:*
Energy Use x Electricity/Emissions Coefficient
- *Waste Sector:*
Methane Commitment Method, which calculates the lifetime emissions associated to the amount of waste sent to landfill in 1994 and allocates this entire sum to the inventory year.

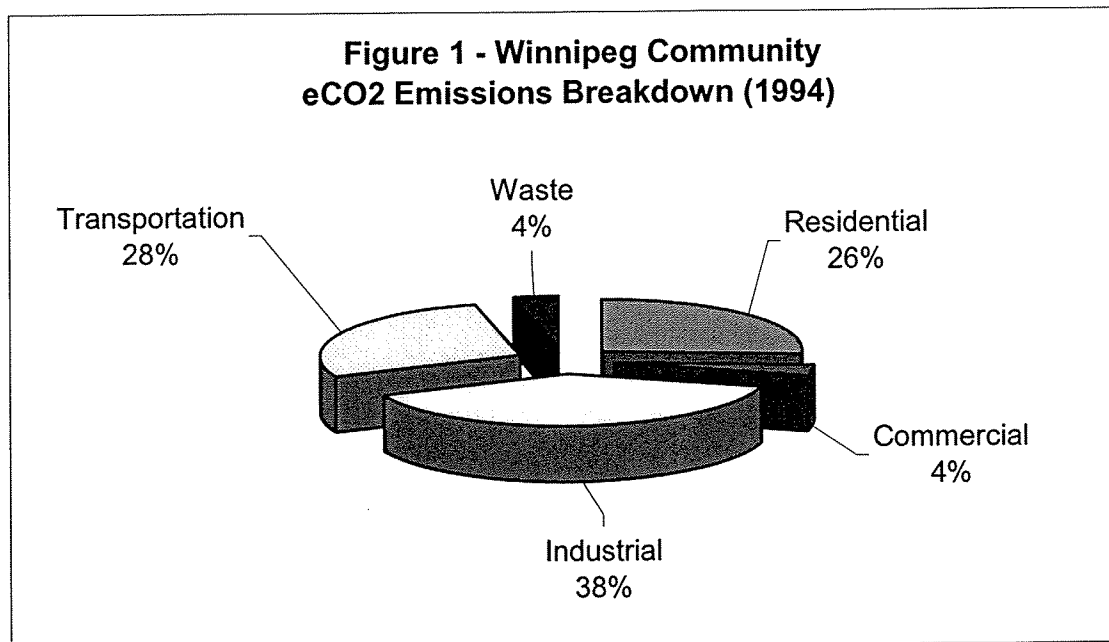
Appendices A through C contain the community inventory reports derived from the CCP Software for 1994, 1998 and 2010, respectively. The Summary report compiles the eCO₂ and energy use per sector while the Source report compiles by fuel type. The Detailed report shows both the sector and source data and includes all the notes included with the data (such as data sources and assumptions). Finally, the Indicators report illustrates the energy use and tones of eCO₂ produced per capita and as per other indicators that were entered into the software.

6.1 1994 Community Inventory Analysis

Winnipeg's 1994 community emissions breakdown by percentage is displayed in Figure 1 and the actual emissions are displayed in Table 1. The industrial sector represents the largest portion of the eCO₂ emissions profile at 38%. The residential and transportation sectors follow closely at 26% and 28% respectively. The waste and the commercial sectors represent a small proportion of the profile at 4% each.

Table 1: 1994 Winnipeg eCO₂ Emissions

Sector	eCO ₂ Emissions (Tonnes)
Residential	1,491,602
Commercial	209,171
Industrial	2,121,086
Transportation	1,575,472
Waste	217,088
Other	0
Total	5,614,419

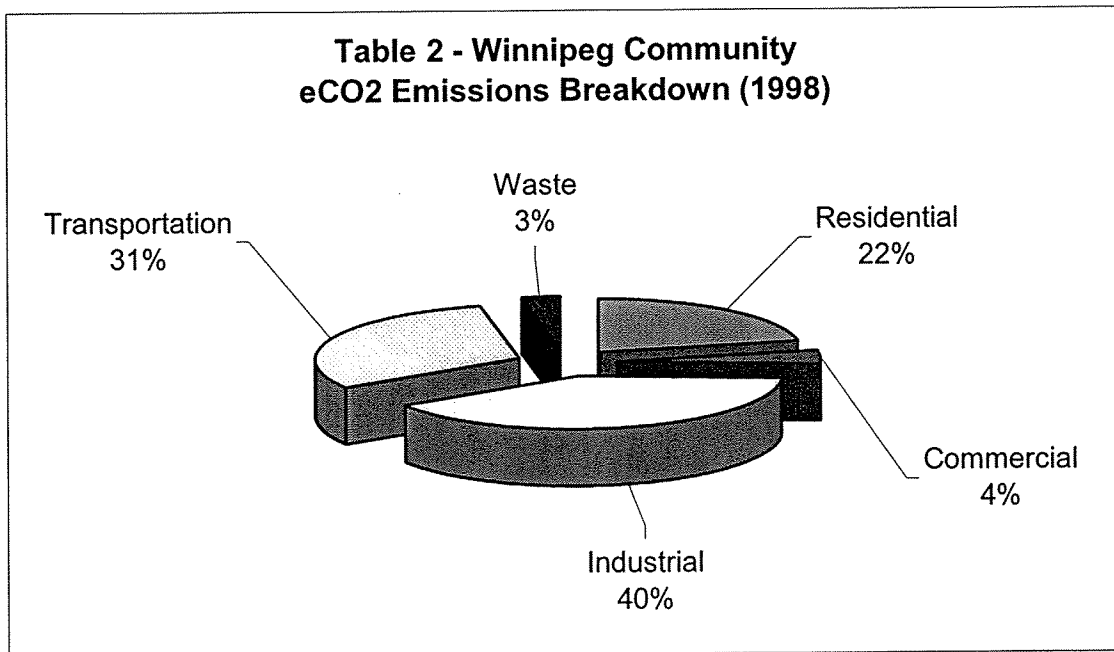


6.2 1998 Community Inventory Analysis

Winnipeg's 1998 community emissions breakdown by percentage is displayed in Figure 2 and the actual emissions are listed in Table 2. Once again, the industrial sector represented the largest percentage of the profile at 40%. The residential sector's emissions increased only slightly, but its share of the profile decreased to 22%, and transportation sector emissions increased to 31%. The waste sector emissions decreased to 3% due the loss of industrial waste now landfilled at a private waste dump. The commercial sector remained lowest at 3%.

Table 2: 1998 Winnipeg eCO2 Emissions

Sector	eCO2 Emissions (Tonnes)
Residential	1,176,928
Commercial	188,323
Industrial	2,102,396
Transportation	1,650,494
Waste	139,183
Other	0
Total	5,257,324

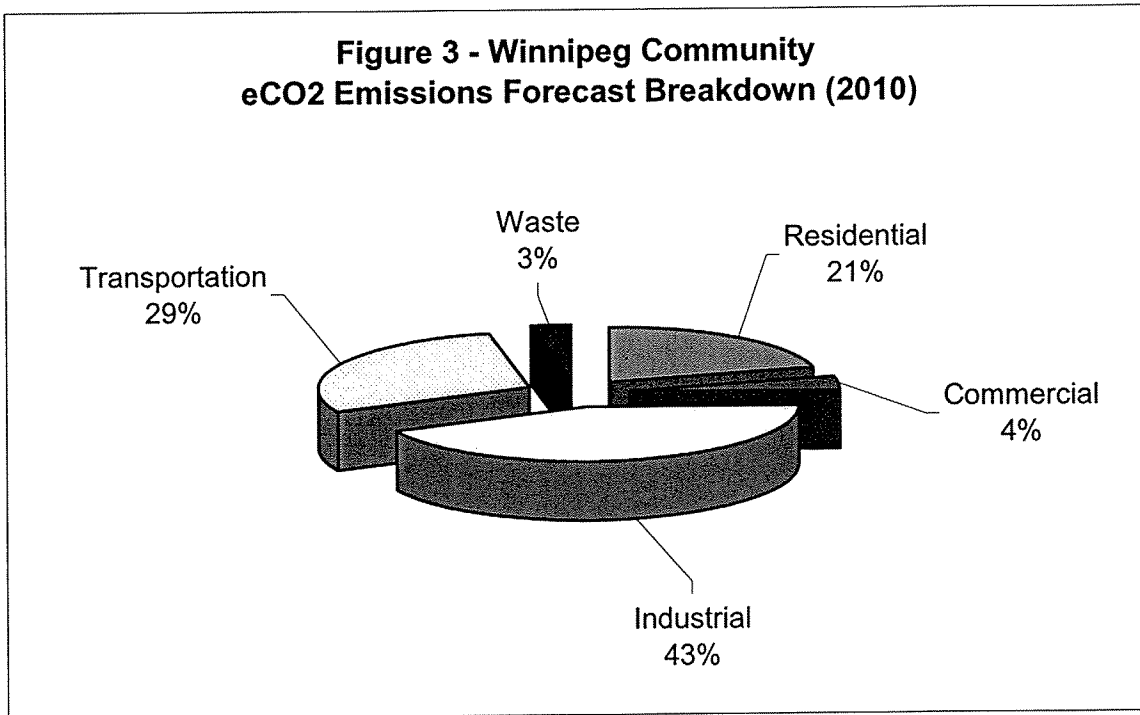


6.3 2010 Community Forecast Analysis

Winnipeg's eCO₂ emissions were forecasted for 2010 based on 1994 and 1998 data as well as growth multipliers supplied for each sector. The results of the forecast are displayed below in Figure 3 and Table 3. Industrial sector emissions are forecasted to increase to 43% of the profile, while the transportation sector followed second at 29%. The residential sector is expected to decrease mainly due to conservation; the waste and commercial sectors are expected to stay the same.

Table 3: 2010 Forecast of Winnipeg eCO₂ Emissions

Sector	eCO ₂ Emissions (Tonnes)
Residential	1,332,500
Commercial	242,556
Industrial	2,733,595
Transportation	1,827,547
Waste	230,982
Other	0
Total	6,367,180

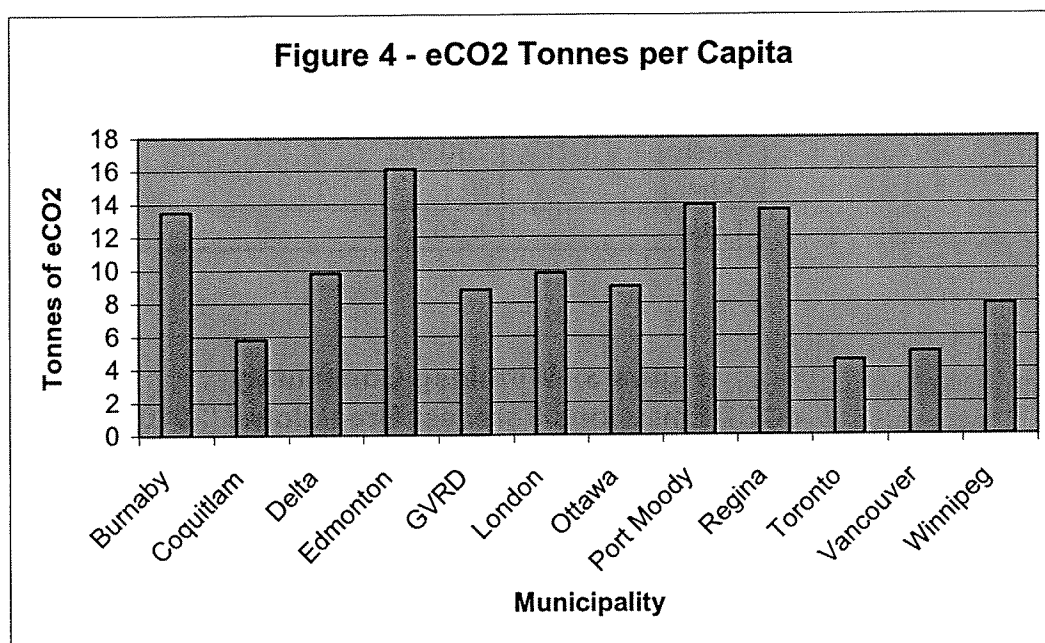


7.0 Per Capita Community Indicator Analysis

The following analysis is based on Winnipeg's 1998 data, while some other cities are based on 1994 or 1995 data. An ICLEI Energy Services Report made the comparisons possible.

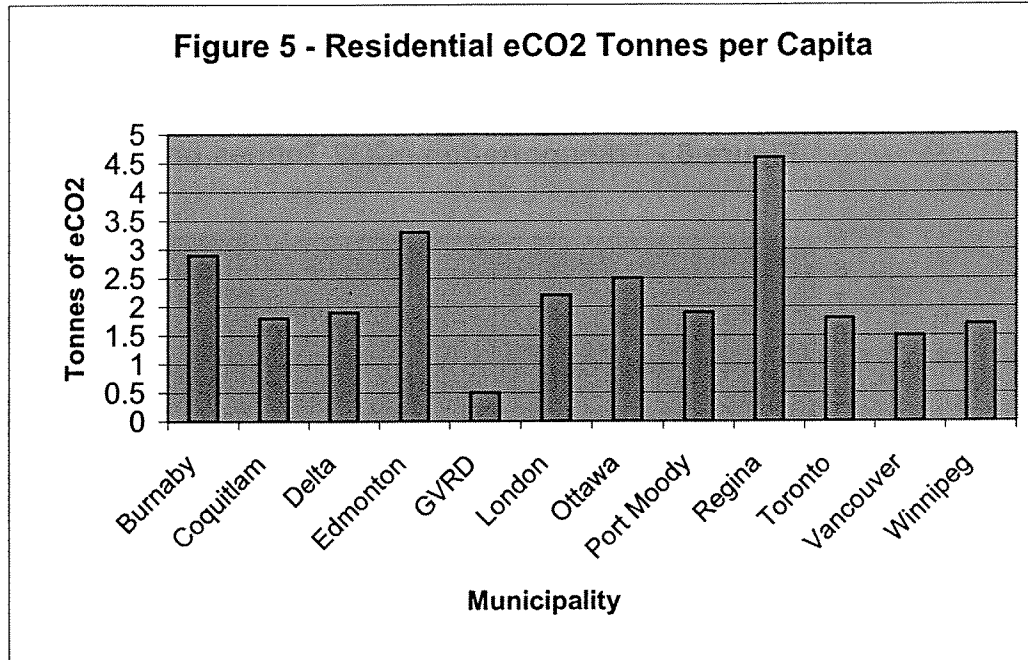
7.1 eCO₂ per Capita Indicator

Figure 4 displays the tonnes of eCO₂ per capita for several Canadian Municipalities with complete baseline inventories. Per capita emissions range from just under 5 tonnes in Toronto to near 16 tonnes in Edmonton. Approximately ten tonnes per capita is the average over these 12 inventories. Winnipeg's per capita emissions were below the average at 7.8 tonnes.



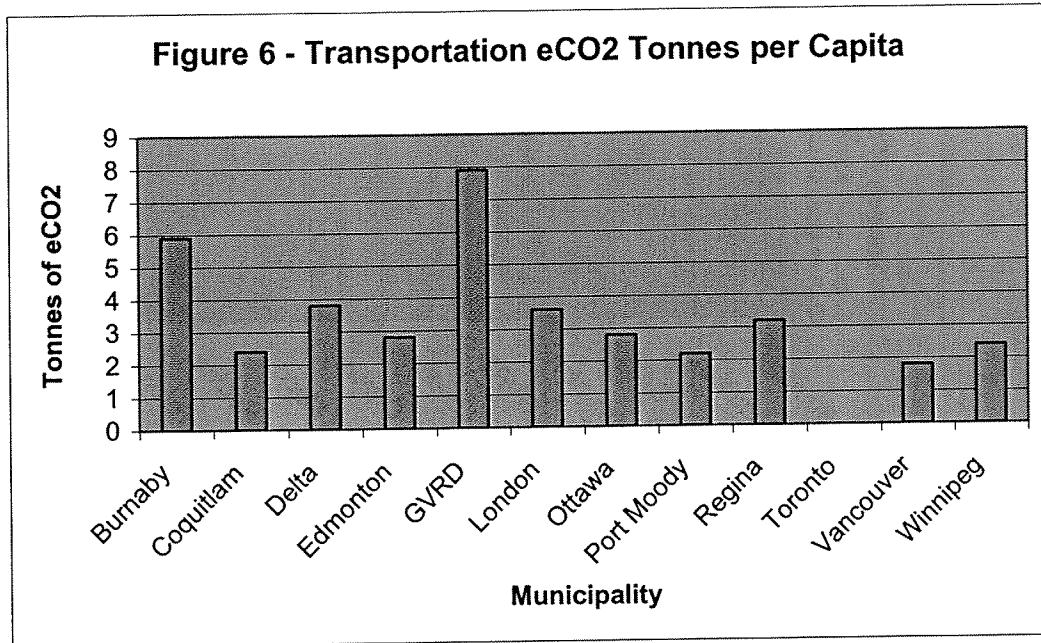
7.2 Residential Sector Analysis

The following figure illustrates the eCO₂ tonnes per capita in the residential sector. This ranges from 0.5 in GVRD to 4.5 in Regina, with 2.2 as the average. Winnipeg fell below the average at 1.7 tonnes.



7.3 Transportation Sector Analysis

Figure 6 displays the tonnes of eCO₂ per capita emitted from the transportation sector within the 12 municipalities. Toronto does not register on this chart since the data was unavailable. The average over all the inventories is 3.2 tonnes per capita, while it ranges from less than 2 tonnes per capita in Vancouver to near 8 in GVRD. Winnipeg fell below the average at 2.4.



8.0 Corporate Inventory Analysis

The following section contains the corporate eCO₂ emission breakdowns for the City of Winnipeg, for 1994, 1998 and a forecast for 2010. The data within the inventory are segregated into 5 sections: buildings, vehicle fleet, streetlights, water/sewage and waste. Basic information on energy use and landfilled waste is compiled and using emission coefficients, the CCP Software calculates the eCO₂ emissions allocated to each sector.

Calculating Emissions

- *Buildings/Vehicle Fleets/Streetlights/Water and Sewage:*
Energy Use x Electricity/Emissions Coefficient
- *Waste:*
Methane Commitment Method: emissions included are those that will eventually result from the waste landfilled in the inventory year. This method accounts for emissions of methane from curbside waste produced in the Analysis year only, and accounts for any gas recovery that is taking place, or will take place at the landfill. This method has been developed for use by the CCP Software because it identifies the emissions affected by the types of “three R” programs now found in most Canadian cities.

Appendices D and E contain corporate inventory reports derived from the CCP Software for 1994 and 1998, respectively. The Summary report compiles the eCO₂ and energy use per sector while the Subsector report compiles these sectors into categories. The Source report compiles by fuel type and the Detailed report shows both the sector and source data and includes all the notes included with the data (such as data sources and assumptions). The Indicators report illustrates the energy use and tones of eCO₂ produced per indicators that were entered into the software.

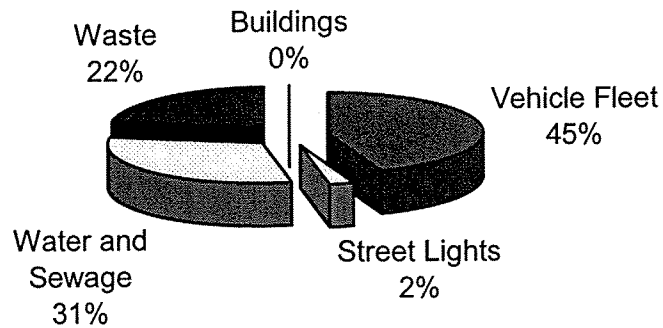
8.1 1994 Corporate Inventory Analysis

Winnipeg's 1994 corporate breakdown is illustrated in Figure 7 and the actual emissions are listed in Table 4. Building data for 1994 was not available and therefore not included. As a result, the emissions breakdowns are less accurate. The transportation sector accounts for 45% of the profile, while the water and sewage sector accounts for 31% and the waste sector accounts for 22%. The streetlight sector only accounted for 2% of the profile.

Table 4: 1994 Winnipeg eCO2 Emissions

Sector	eCO2 Emissions (Tonnes)
Buildings	0
Vehicle Fleet	17,358
Street Lights	966
Water/Waste Water	12,094
Waste	8,707
Other	0
Total	39,126

Figure 7 - Winnipeg Corporate eCO2 Emissions Breakdown (1994)



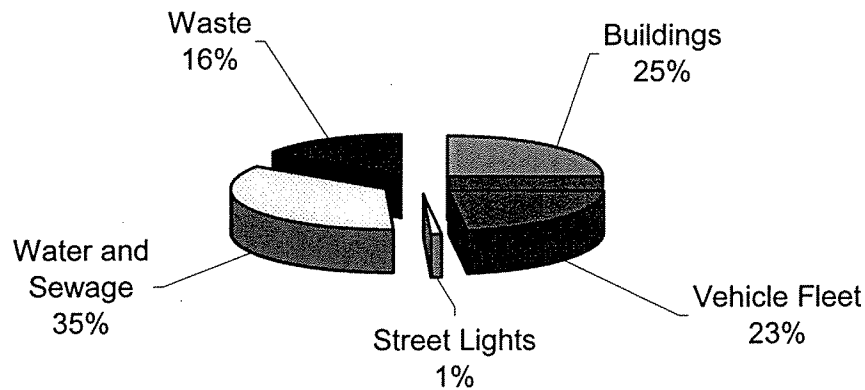
8.2 1998 Corporate Inventory Analysis

Winnipeg's 1998 corporate breakdown is illustrated in the figure below and the actual emissions are listed in Table 4. Building data was collected for this analysis, yet it was not a complete compilation. Only approximately 200 of all corporate buildings were included, due to incomplete records. The building sector accounted for 25% of the profile and the water and sewage sector accounted for 35%. The vehicle fleets were responsible for 23% of the emissions, while the emissions from waste and streetlights contributed 16% and 1%, respectively.

Table 5: 1998 Winnipeg eCO2 Emissions

Sector	eCO2 Emissions (Tonnes)
Buildings	17,808
Vehicle Fleet	16,175
Street Lights	860
Water/Waste Water	24,815
Waste	11,042
Other	0
Total	70,699

Figure 8 - Winnipeg Corporate eCO2 Emissions Breakdown (1998)



9.0 Corporate Indicator Analysis

In the community analysis it was possible to analyze the inventories using population counts to develop per capita indicators. Such an analysis is not feasible with the corporate inventories. Indicators such as – floor area for buildings, or litres of output in water/sewage operations – were collected, however there was not a sufficient supply of indicators throughout the inventories to yield a creditable analysis.

