



# 2002-2004 Corporate Inventory of Greenhouse Gas Emissions

Agglomeration of Montréal

Montréal 

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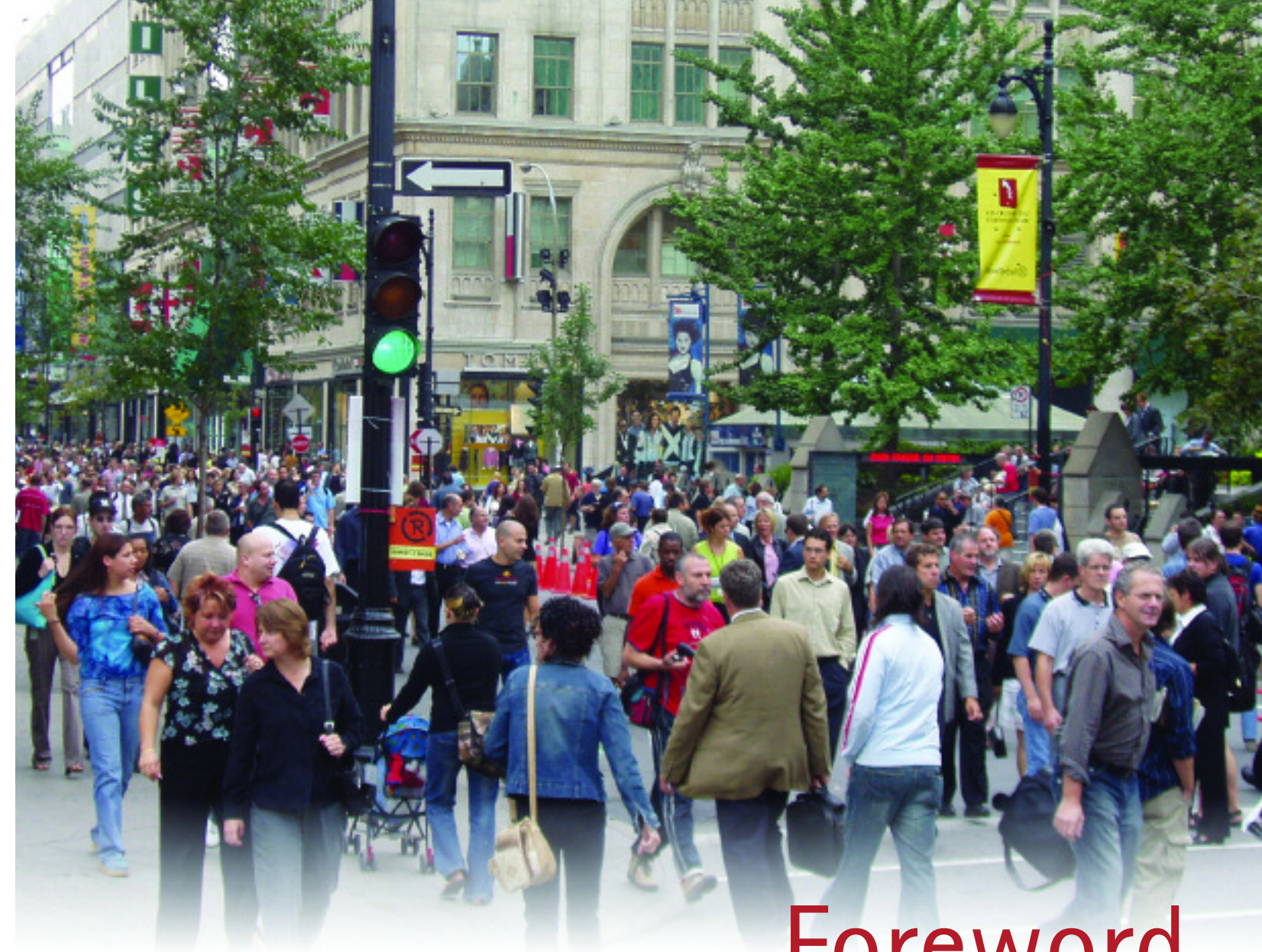
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# Foreword

An inventory of greenhouse gas (GHG) emissions is not an end in itself. Its sole purpose is to generate, guide and support actions to protect our climate.

Reducing GHG emissions of the agglomeration's cities means first reducing their energy bill. By investing in energy efficiency, cities can benefit from available financial assistance programs and maintain their array of services to citizens.



# Summary

The corporate inventory of municipal operations on the island of Montréal was 196 ktCO<sub>2</sub>e in 2002, 204 ktCO<sub>2</sub>e in 2003 and 189 ktCO<sub>2</sub>e in 2004. Resolution CE05 5020 adopted on November 23, 2005, calls for a 20% reduction in corporate emissions between 2002 and 2012, a reduction rate of 2% per year. Because the inventory's margin of error is greater than 5%, it cannot be used as a tool to monitor progress from one year to the next. Rather, it is intended as a monitoring tool for the medium term.

Emissions are shared almost equally between the boroughs and reconstituted cities and the central units (wastewater treatment, police, museums, etc.). In terms of energy usage, there are three main sources of GHG emissions: buildings (36%), vehicles (28%), and the wastewater treatment plant (20%). The chief form of energy responsible for GHG emissions is natural gas (41% of emissions), used mostly in buildings. Electricity, diesel and gasoline each make up about 14% of GHG emissions.

The inventory should serve to guide, encourage and sustain energy-saving actions. Reducing municipalities' GHG emissions means reducing their energy bills. At a time of rapidly rising energy prices, protecting the climate can be a profitable environmental strategy for municipalities, particularly as the number of financial assistance programs for energy efficiency projects grows.

Better energy management is a necessity if municipalities wish to continue offering the same level of service to their citizens. By developing GHG emission reduction projects at the corporate level, cities are leading the way in helping the community adopt a sustainable development approach that respects the climate's equilibrium.



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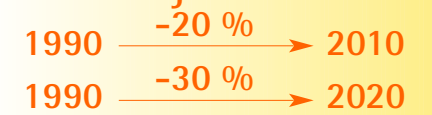
# Chapter 1

## Montréal: a partner in climate protection

### 1.1 International context

On December 5, 2005, the United Nations Framework Convention on Climate Change (UNFCCC), the UN agency that manages the Kyoto Protocol, concluded two weeks of negotiations among 189 countries, before the many eyes, cameras and telephoto lenses of nearly 10,000 participants, observers and journalists. It was a massive gathering, on the scale of the issues at stake. These negotiations, in which the Canadian delegation played a leading role, led to the Montréal Action Plan.

#### Montréal community objectives



In February 2002, in accordance with the Kyoto Protocol negotiated seven years earlier, Canada committed to reducing its GHG emissions by 6% compared to 1990 levels. On December 5, 2005, the Mayor of Montréal brought the Municipal Leaders Summit on Climate Change to a close by reading a statement in which cities from around the world committed to cutting their emissions by 20% by 2010, by 30% by 2020, and by 80% by 2050.

Speech by Mayor Gérald Tremblay at COP11/MOP1 of the UNFCCC, December 2005, Montréal



Source : Denis Labine



# Chapter 2

## GHG inventory: an energy inventory

### 1.2 Montréal: action at heart

In its *First Strategic Plan for Sustainable Development*, the Montréal community committed to producing an inventory of corporate emissions and an inventory of the community's emissions (Action 1.2: *Develop a comprehensive Montréal strategy regarding GHG emissions*). The following report is the embodiment of this commitment and a first step toward new actions to protect our climate's equilibrium.

On November 23, 2005, the city of Montréal (merged at the time) adopted Resolution CE05 5020 in which it committed to reducing its corporate GHG emissions by 20% by 2012 compared to 2002 levels. After a first successful phase of emissions reductions between 1990 and 2002, Montréal initiated its second phase of reduction efforts, joining 130 other Canadian cities in the "Partners for Climate Protection" program launched by the Federation of Canadian Municipalities (FCM).

**Corporate objective**  
 1990  $\xrightarrow{-86\%}$  2012

The city of Montréal team for the UNFCCC in collaboration with Environment Canada



Source : L. Lapointe

The corporate inventory of greenhouse gas emissions for the agglomeration of Montréal accounts for only 1.4% of the community's emissions. This excellent result is primarily due to the capture of biogas at the Saint-Michel Environmental Complex (SMEC) to generate electricity.

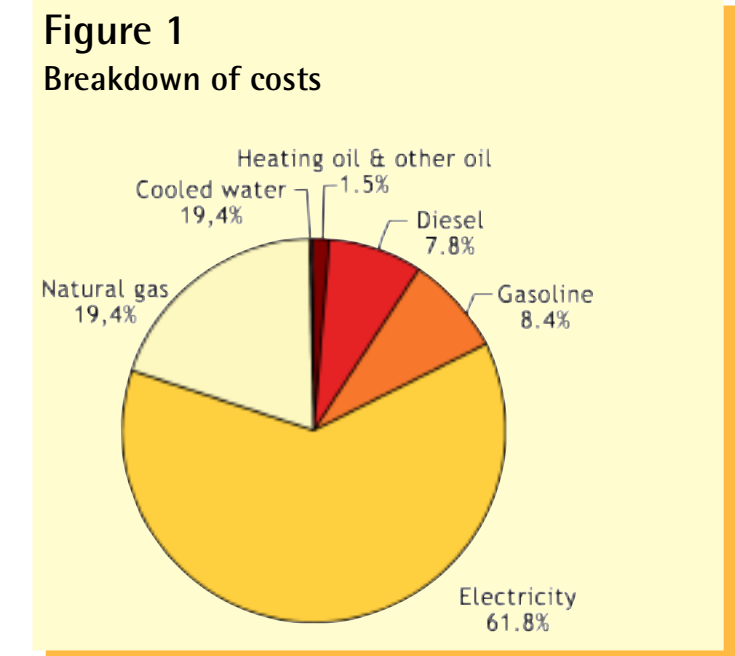
First and foremost, this inventory aims to identify how the municipalities of the agglomeration can manage their energy consumption more efficiently.

The sharp increase in the price of energy is already being felt in municipal budgets, eating away at the capacity of administrations to maintain their services. In this context, energy management becomes a corporate necessity.

The cities of the agglomeration also have a role to play in encouraging the community as a whole to embark on the path of sustainable development. They must be able to respond to the growing number of permits for renewable energy production facilities. Municipal services need to make sure they consider the feasibility of reduction measures, to determine what can be done at what cost.

To maintain their expertise and exercise their leadership, cities must therefore preach by example and set enforceable standards.

**Energy bill:**  
 nearly \$125 million



**GHG emission =**  
 Energy expenditure

# Chapter 3

## Methodology

### 3.1 Reference

The corporate inventory was carried out according to the following international standards: ISO 14064-1, 14064-2 and 14064-3. In accordance with these standards, GHG emission is attributed to a municipal entity (as it existed for the 2002-2004 period) in either of two cases:

- the emission source belongs to the municipal entity or is under its control (direct GHG emission)
- the GHG emission comes from the production of electricity, heat or steam imported and consumed by the municipal entity

The demerger and the advent of reconstituted cities on January 1, 2006, has an impact on the management of GHG emissions insofar as every city belonging to the Montréal agglomeration is an autonomous legal entity in its own right, and therefore responsible for its GHG emissions and owner of any eventual reduction credits.

However, because management of GHGs falls under the jurisdiction of the Montréal agglomeration, the corporate inventory for 2006 and subsequent years will include all cities in the agglomeration. Consistency with the 2002-2004 inventory will therefore be maintained.

### 3.2 Operational perimeter concept

Defining the operational perimeter leads us to identify emission sources associated with the operations of the cities in the agglomeration. We propose three perimeters, defined as follows:

**Perimeter 1:** All sources belonging to a city within the Montréal agglomeration. This first perimeter is the area in which cities can act directly to reduce GHG emissions.

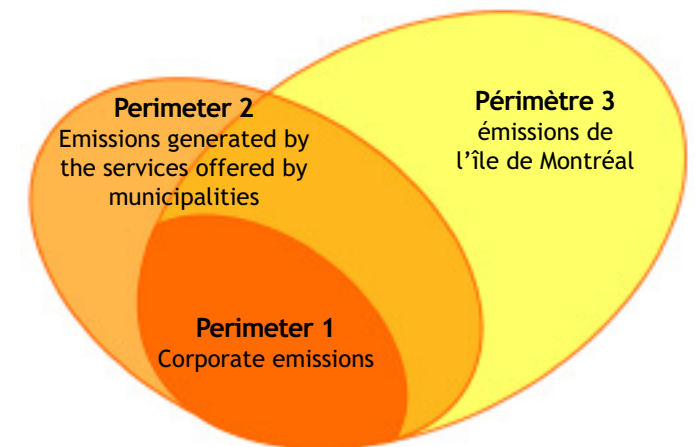
**Perimeter 2:** All sources belonging to a city within the Montréal agglomeration, or to a paramunicipal organization, as well as emissions generated directly by an activity related to services that the agglomeration's municipalities must provide (snow removal, garbage collection and disposal, etc.). This second perimeter is an area where cities can have an important influence in reducing GHG emissions.

**Perimeter 3:** All GHG sources located on the territory of the Montréal agglomeration. This last perimeter includes all of the Montréal community using a purely geographic criterion. It is the purpose of this report.

The corporate inventory presented here is limited to the first perimeter. Consequently, any GHG emissions generated by municipal services subcontracted to third parties have not been taken into account (such as snow removal or garbage collection that has been contracted out). Emissions resulting from the burial of municipal waste in third-party facilities have not been taken into account either. It is therefore the organization that has been paid to handle this waste that is responsible for these emissions and that owns any eventual reduction credits.

The case of paramunicipal organizations is problematic. Despite the criteria of the ISO 14064-1 standard, they are not included here. However, all the tools developed by the city are at their disposal to help them carry out their own inventories.

Figure 2  
Inventory perimeters



An inventory for every city in the agglomeration

Corporate inventory =  
Balance sheet of energy  
consumption  
in facilities owned by the  
city



# Chapter 4

## Inventory of sources

### 3.3 Greenhouse gases calculated

The greenhouse gases calculated were the six GHGs targeted by the Kyoto Protocol: carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF<sub>6</sub>).

Other gases, such as ozone and some volatile organic compounds (VOC), are also considered greenhouse gases: they absorb visible light and redistribute it in the form of infrared radiation (ISO 14064). Calculations were limited to the six gases listed for reasons of comparison with international agreements and for pragmatic reasons of carrying out the inventory. It is important to keep in mind, however, that efforts taken to improve air quality also have a beneficial impact on climate protection.

GHGs calculated:  
the six gases of the  
Kyoto Protocol

### 3.4 Emission factors

The emission factors used come from the Écogeste spreadsheets set up by the Ministère du Développement durable, de l'Environnement et des Parcs du Québec (MDDEP) based on the emission factors published by Environment Canada (Canadian GHG Challenge Registry, Emission Factors, version 4.3, August 2005).

The factor used for electricity supplied by Hydro-Québec, for the years 2002 to 2004, is 0.022 kgCO<sub>2</sub>e/kWh (factor proposed for Quebec by ICLEI—Local Governments for Sustainability as part of the FCM's "Partners for Climate Protection" program). This factor varies according to Hydro-Québec's electricity imports and exports.

In accordance with the Canadian system proposed for compensating for CO<sub>2</sub> emissions, solar and wind energy are assumed to be entirely clean, producing no GHGs. This convention is not universal, however. The full list of emission factors used is provided in Appendix 2.

### 4.1 Overview

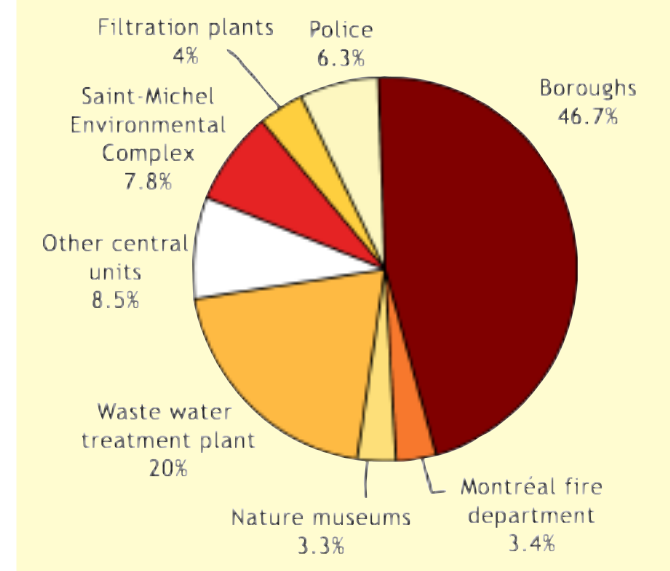
The administrative division of sources was dictated by the data obtained and by the corporate structure in place at the time of the inventory. Sources were divided as follows:

- Direction des immeubles (building inventory of the former city)
- Direction du matériel roulant (vehicle fleet of the former city)
- 27 boroughs (their own building inventories and vehicle fleets)
- Wastewater treatment plant
- Filtration plants
- Police department (vehicle fleet)
- Traffic signals and street lighting
- Saint-Michel Environmental Complex (SMEC)
- Montréal Nature Museums (Biodôme, Insectarium, Botanical Garden, Planetarium)

Corporate GHG emissions—189 ktCO<sub>2</sub> in 2004—were distributed equally between, on the one hand, central units and, on the other, the boroughs and reconstituted cities.

50 % central  
50 % boroughs

**Figure 3**  
Relative contribution of administrative units to corporate emissions



To come up with this estimate, the emissions produced by central units were arbitrarily separated from those of the nine boroughs of the former city.



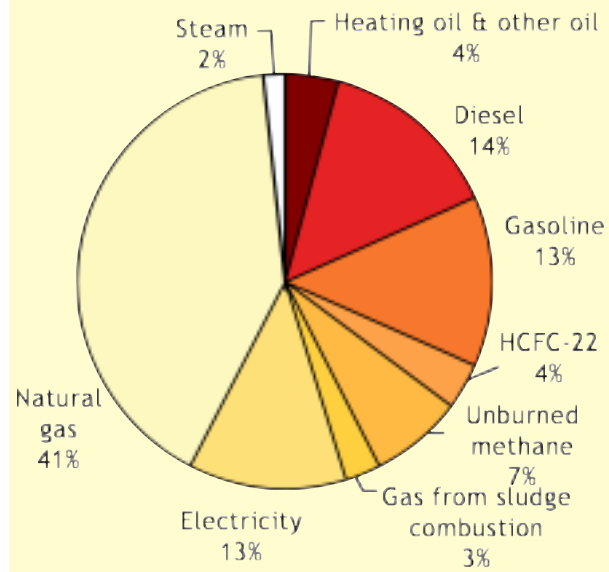
## 4.2 Energy sources

All forms of energy that produce GHG emissions, either directly or indirectly, and that are used by the cities of the agglomeration were taken into account. These were as follows:

- Natural gas
- Electricity
- Heating oil (no. 2 and no. 6 fuel oil)
- Gasoline
- Diesel
- Imported cooled water
- Propane
- Imported steam

**Natural gas:  
the leading source of  
GHGs  
in municipal facilities**

**Figure 4**  
Breakdown of emissions by energy source



Natural gas, used to heat buildings and incinerate sewage sludge, is the primary source of GHGs for the agglomeration's municipalities. The second largest source is fuel consumption (gasoline and diesel) in vehicles. Refrigerant gases, used in office air-conditioning systems as well as municipal arenas, are counted as a separate source of GHGs. Refrigerant gases taken into account are listed in Appendix 2.

## 4.3 Energy uses

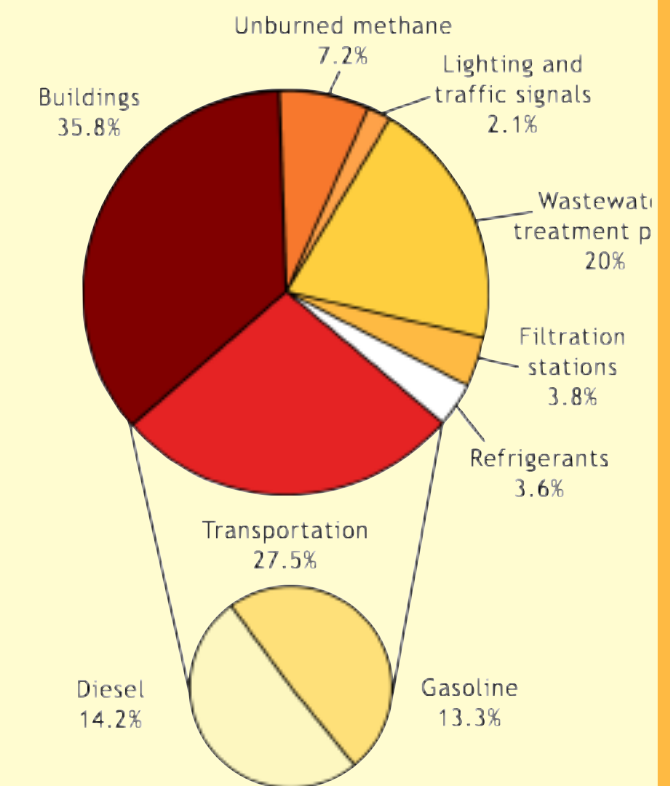
Another way to look at energy consumption is by type of usage (see Figure 5). From this perspective, buildings and vehicles are responsible for nearly two-thirds of GHG emissions.

Reaching the GHG reduction objective set out in resolution CE05 5020 will require taking action on two fronts simultaneously:

- reducing energy consumption in the agglomeration's municipal buildings
- reducing fuel consumption by municipal vehicles

**Two main consumers:  
buildings and vehicles**

**Figure 5**  
Breakdown of GHG emissions by activity (2004)



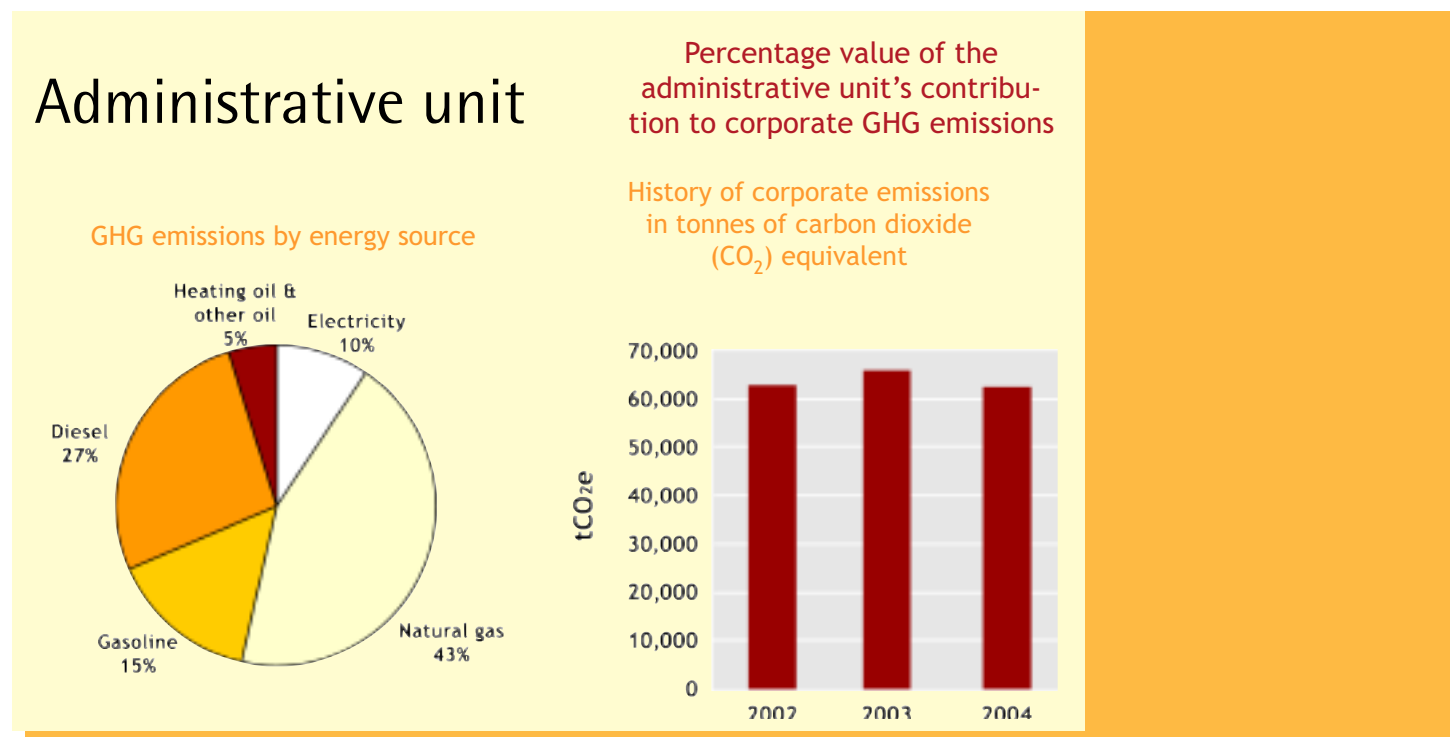


## 4.4 Profiles

A series of data sheets have been created to synthesize the data. They are divided into three parts:

- Top right: the percentage value of the administrative unit's contribution to corporate GHG emissions
- Bottom left: graphs
- Bottom right: photos of the administrative unit

**Figure 6**  
Example of a data sheet on GHG emissions by an administrative unit



**Table 1**

Corporate GHG emissions of the boroughs and central units

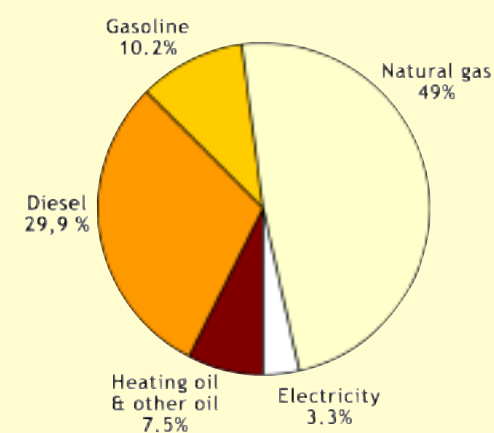
Borough	% of CO <sub>2</sub> e in 2002	% of CO <sub>2</sub> e in 2003	% of CO <sub>2</sub> e in 2004
Ahuntsic-Cartierville	2.5%	2.6%	2.3%
Anjou	0.9%	0.9%	1.0%
Beaconsfield-Baie d'Urfé	0.8%	0.8%	0.8%
Côte-des-Neiges-Notre-Dame-de-Grâce	2.4%	2.5%	2.3%
Côte-Saint-Luc-Hampstead-Montréal-Ouest	1.3%	1.3%	15%
Dollard-des-Ormeaux-Roxboro	1.0%	1.0%	11%
Dorval-Île-Dorval	0.9%	0.9%	10%
Île Bizard-Sainte-Geneviève-Sainte-Anne-de-Bellevue	0.2%	0.3%	0.3%
Kirkland	No data	No data	No data
Lachine	1.3%	1.3%	1.5%
LaSalle	1.5%	1.5%	1.6%
Mercier-Hochelaga-Maisonneuve	3.8%	4.1%	3.7%
Montréal-Nord	1.3%	1.3%	1.4%
Mont-Royal	1.1%	1.1%	0.9%
Outremont	0.4%	0.4%	0.5%
Pierrefonds-Senneville	0.9%	0.7%	0.9%
Le Plateau-Mont-Royal	2.5%	2.7%	2.5%
Pointe-Claire	1.8%	2.3%	3.2%
Rivière-des-Prairies-Pointe-aux-Trembles-Montréal-Est	3.3%	3.6%	3.2%
Rosemont-La Petite-Patrie	3.1%	3.2%	3.1%
Saint-Laurent	1.3%	1.6%	1.8%
Saint-Léonard	1.2%	1.2%	1.3%
Le Sud-Ouest	2.7%	2.9%	2.5%
Verdun	1.2%	1.3%	1.2%
Ville-Marie	2.1%	2.1%	2.1%
Villeray-Saint-Michel-Parc-Extension	3.2%	3.5%	3.0%
Westmount	1.1%	1.1%	1.2%
Central units	% of CO <sub>2</sub> e in 2002	% of CO <sub>2</sub> e in 2003	% of CO <sub>2</sub> e in 2004
Montréal Fire Department	3.3%	3.3%	3.4%
Police Department	6.3%	6.3%	6.3%
Montréal nature museums	3.0%	3.2%	3.3%
Wastewater treatment plant and sewage pumping station	20.7%	19.8%	20.2%
Filtration plants and drinking water production	3.7%	3.5%	4.0%
Saint-Michel Environmental Complex (SMEC)	10.3%	8.7%	7.8%
Autres services centraux	8.3%	8.5%	8.5%



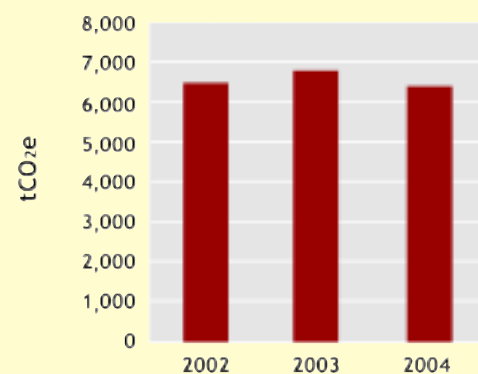
## Montréal Fire Department

Contribution to corporate emissions  
**3,4%**

GHG emissions by energy source in 2004



History of corporate emissions

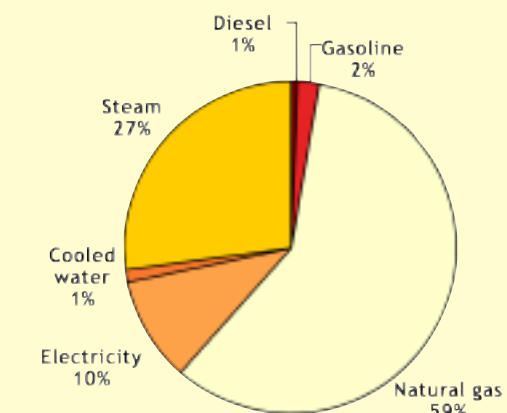


## Montréal Nature Museums

Contribution to corporate emissions  
**3.3%**

The Montréal Nature Museums unit comprises the Insectarium, the Botanical Garden, the Biodôme and the Planetarium. The nature museums have very atypical activities within the municipal administration. Their facilities consume large quantities of natural gas and water vapour imported from the Olympic Installations Board. The emission factor for imported steam was established specifically for this site according to how the steam is produced.

GHG emissions by energy source in 2004

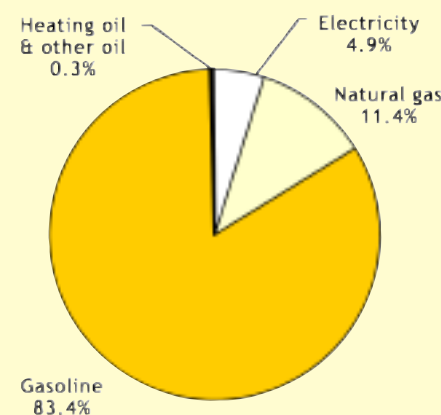


## Police Department

Contribution to corporate emissions  
**6.3%**

The share of the city of Montréal Police Department (SPVM) in the agglomeration's corporate balance sheet is 6.4%. Reducing GHG emissions will therefore also require reductions in this sector. The SPVM uses energy for both buildings and vehicles. The majority of its GHG emissions, however, come from the gasoline used by its vehicles.

GHG emissions by energy source in 2004

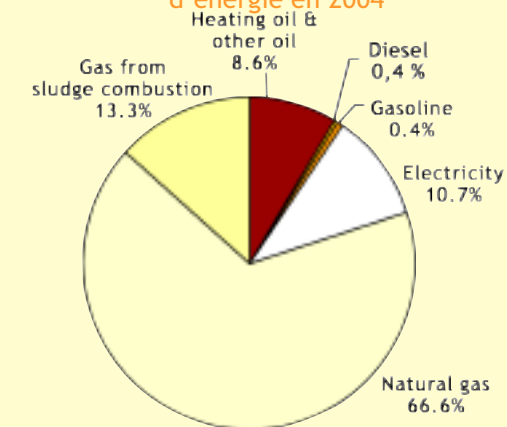


## Wastewater treatment plant and sewage pumping station

Contribution to corporate emissions  
**20,2%**

Montréal's wastewater treatment plant has the distinct characteristic of incinerating most of the sludge produced by the filtration process on-site. This incineration is carried out by burning natural gas, and is therefore responsible for close to 80% of the plant's emissions. In accordance with the Kyoto Protocol, the calculation of GHG emissions does not include the CO<sub>2</sub> resulting from the combustion of the sludge's organic carbon.

Émissions de GES selon la source d'énergie en 2004





## Filtration plants and drinking water production

Contribution to corporate emissions  
**4%**

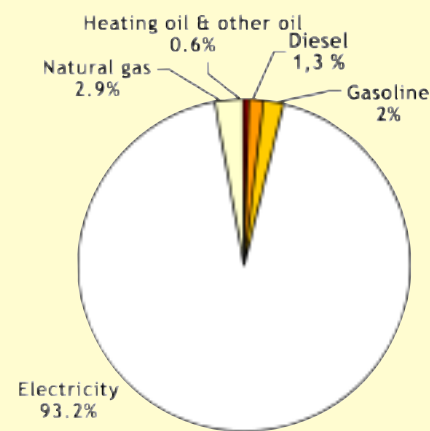
Seven drinking water production plants belonging to municipalities were counted on the territory of the Montréal agglomeration:

- Sainte-Anne-de-Bellevue plant
- Pierrefonds plant
- Dorval plant
- Lachine plant
- Pointe-Claire plant
- Atwater plant
- Charles-J.-desBaillets water treatment plant

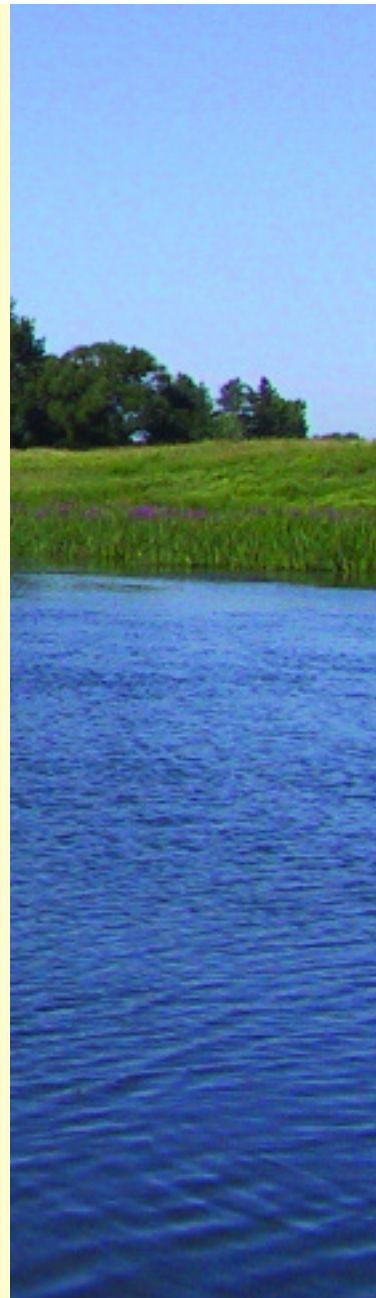
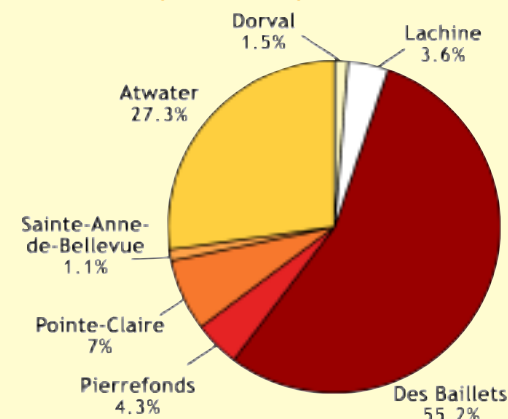
The GHGs reported for the filtration plants concern only the water treatment and pumping processes. Most of the island's water is produced by the Atwater and Charles-J.-desBaillets plants. Consequently, these two plants account for 82% of emissions in this sector.

With the exception of the Sainte-Anne-de-Bellevue plant, which also burns no. 2 fuel oil, the island's drinking water plants run primarily on electricity and consume very little natural gas. Therefore, in terms of GHG emissions, very little gains would be made by replacing their consumption of fossil fuel.

GHG emissions by energy source in 2004



GHG emissions from drinking water production plants



## Saint-Michel Environmental Complex (SMEC)

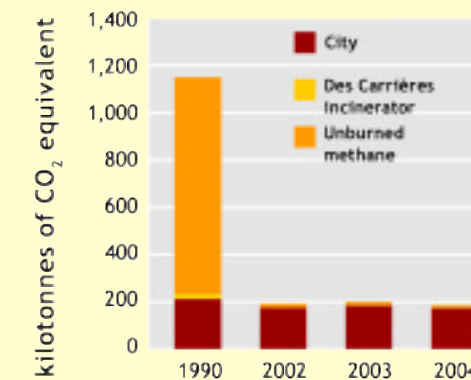
Contribution to corporate emissions  
**7.8%**

Since 2000, the SMEC has been accepting only dry, non-decomposable waste. However, waste buried in the past continues to decompose and emit biogas. Ninety-eight percent (98%) of this biogas is collected by wet wells and burned by a private company to produce electricity. Therefore, for this municipal facility, only non-captured biogas constitutes a source of GHGs.

Without this significant measure, biogas emissions would represent 80% of corporate emissions. The residual portion of emissions (13 ktCO<sub>2</sub>e) still represents close to 7% of corporate emissions, but should decline naturally in the coming years.

However, the benefits of this measure must be tempered by the export of waste outside the corporate inventory, off the island. This transfers both ownership of reduction credits and responsibility for GHG emissions related to the waste to a third party.

GHG reductions resulting from biogas capture





## Traffic signals and street lighting

Contribution to corporate emissions  
**2%**

Traffic signals and street lighting use only electric energy. Because most of the electricity distributed in Québec is of hydraulic origin, it is attributed a very low emission factor. As a result, this sector is responsible for only 2% of corporate GHG emissions (3,976 tCO<sub>2</sub>e) even though it represents a significant energy expenditure (180.7 million kWh). Since traffic signals and lighting equipment do not have individual counters, consumption was calculated according to the power of the equipment installed and the energy consumption billed by Hydro-Québec. These results are the object of some debate, however, since the electronic equipment in traffic lights is heated only part of the year. Real consumption is therefore lower than the consumption calculated based on power. As well, it was not possible to obtain data for some cities. The missing data was calculated on a pro rata basis of the population served.

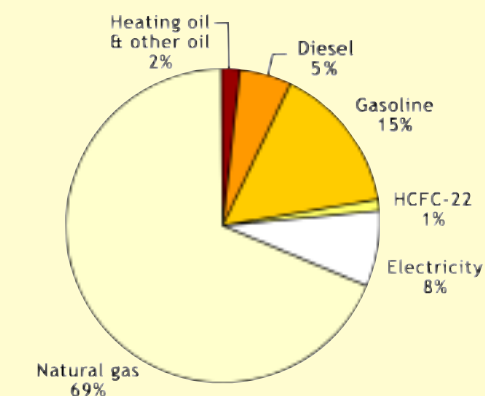


## Boroughs

Contribution to corporate emissions  
**8.5%**

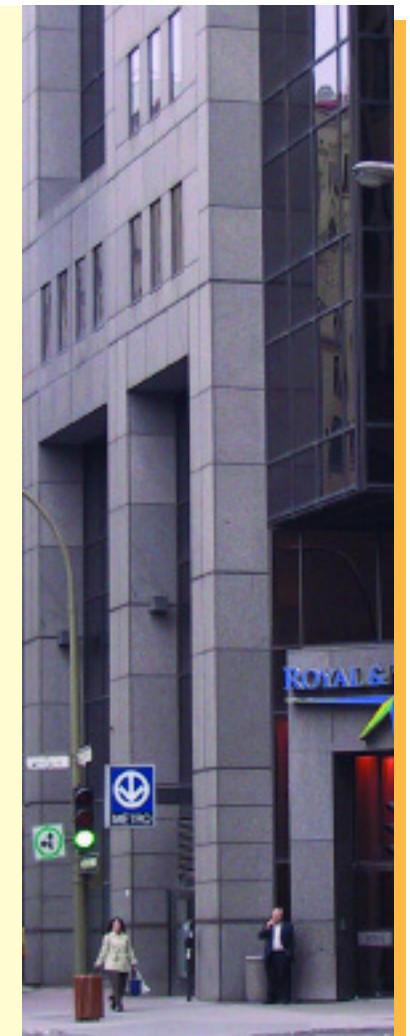
The corporate inventory was carried out for the 2002-2004 period. During this time, the city of Montréal contained 27 boroughs. Local referendums led to an administrative redistribution of the island of Montréal, creating reconstituted cities and new boroughs on January 1, 2006. This inventory is based on the administrative distribution in effect at the time of data collection. It will be adapted to reflect the new administrative context in subsequent years.

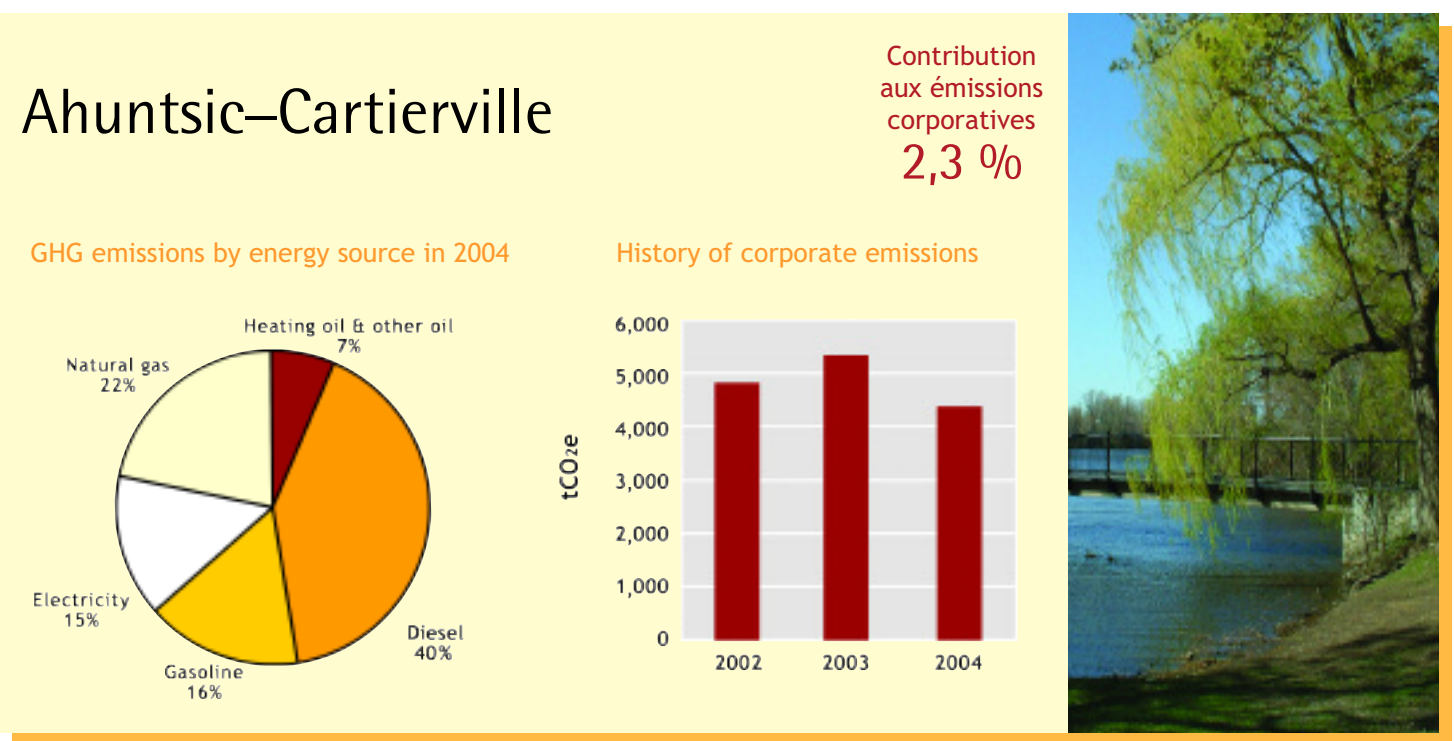
GHG emissions by energy source in 2004 - Boroughs



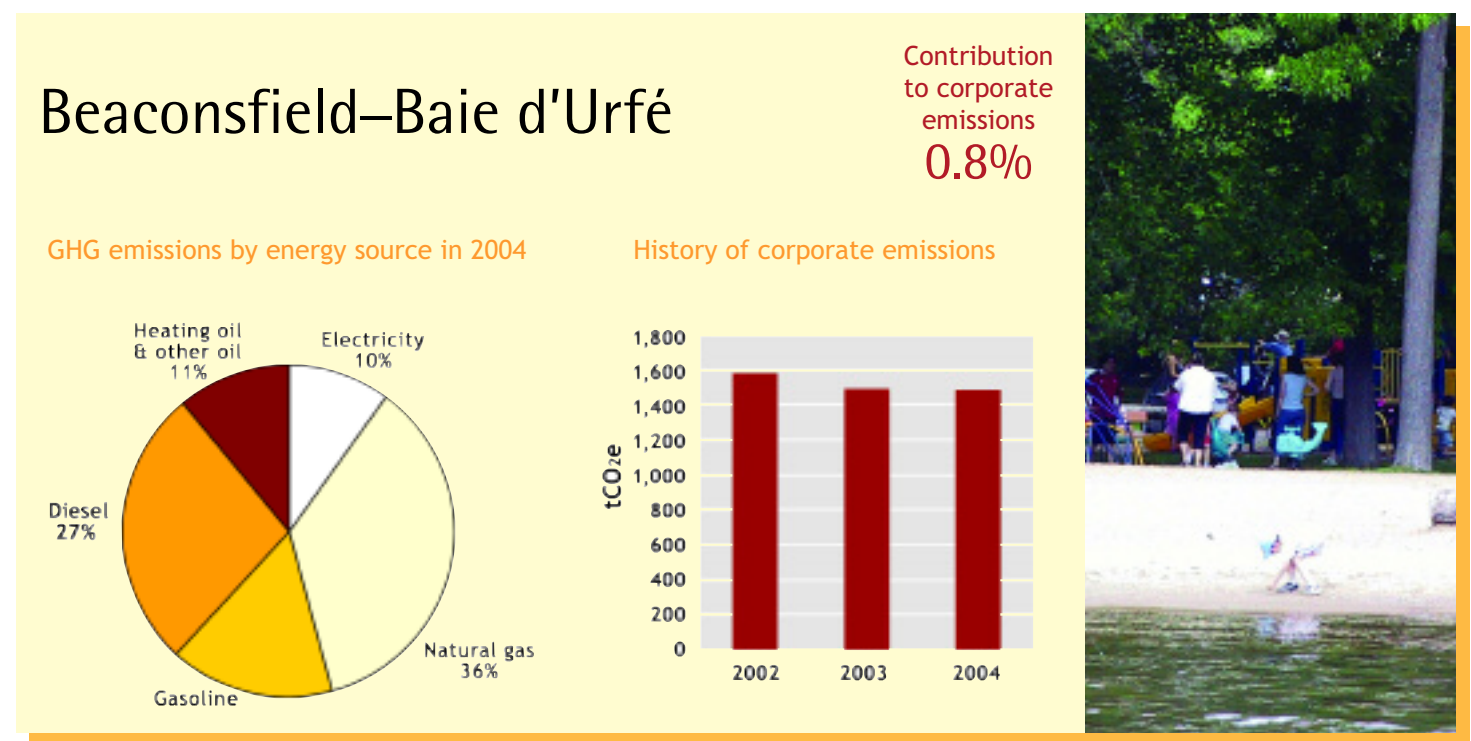
A typical profile of emissions resulting from municipal operations in a borough contains two primary emission sources: buildings (mostly related to the consumption of natural gas) and vehicles (emissions shared more or less equally between diesel and gasoline).

Each borough plays a modest part in the corporate balance sheet, accounting for between roughly 1% and 4% of emissions, depending on the size of its population. However, it is estimated that all together, activities in the boroughs make up close to half of corporate emissions.

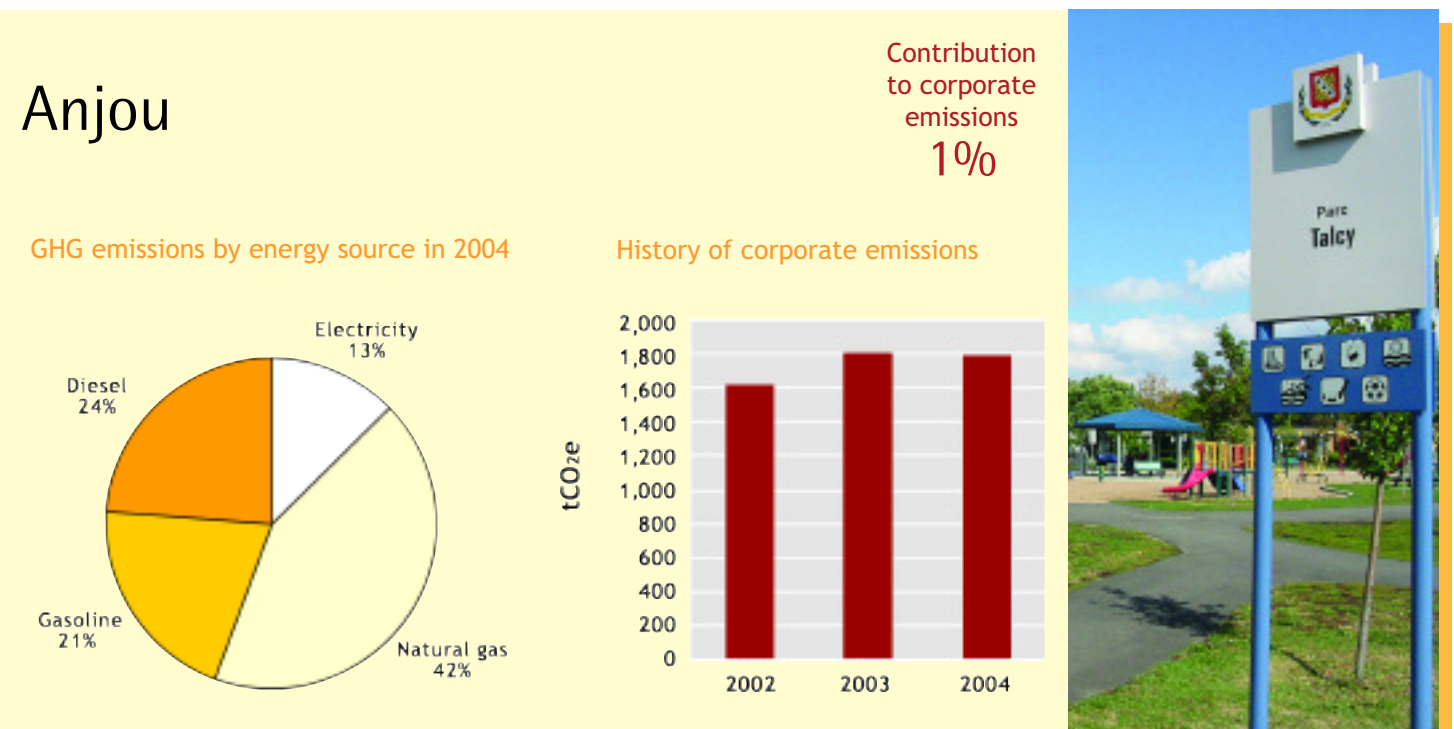




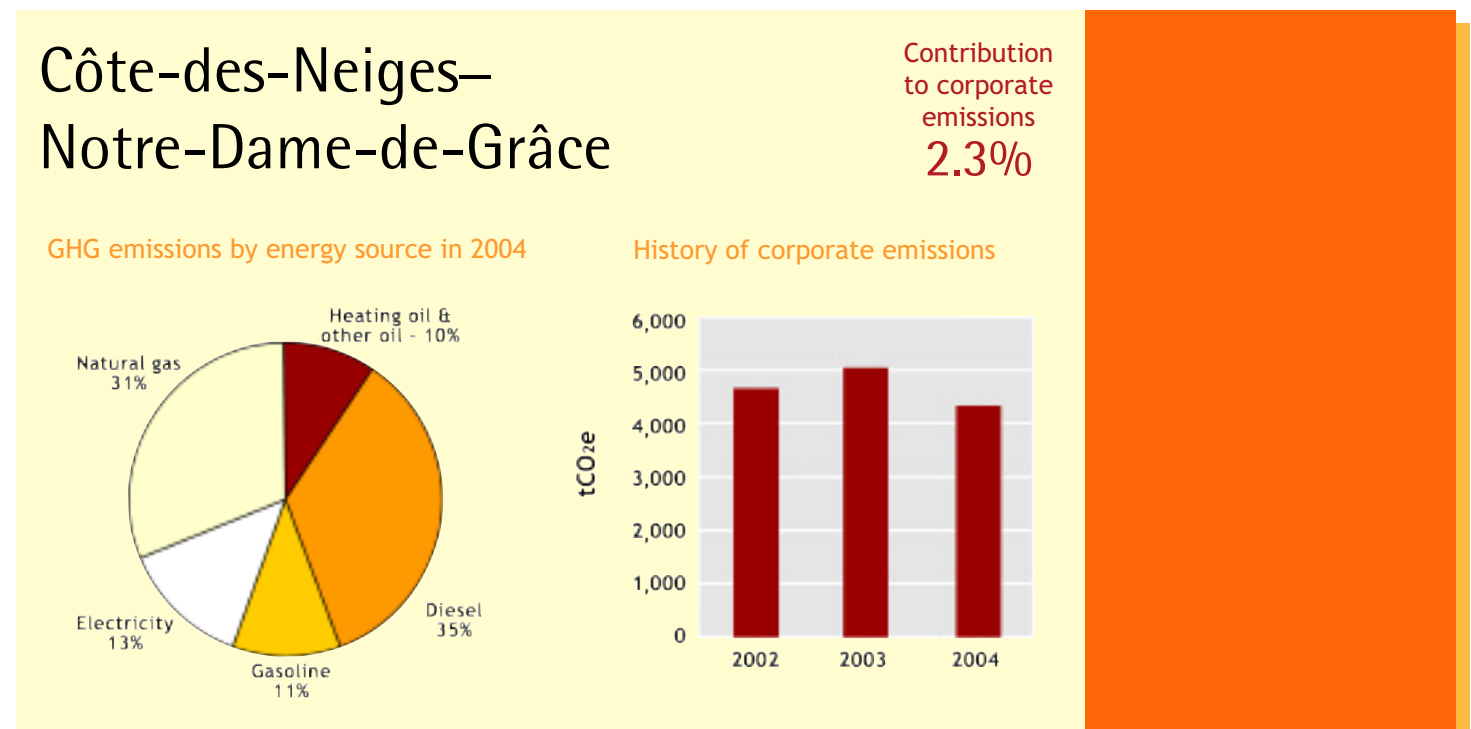
Photograph: Raimbault Park, Ahuntsic–Cartierville borough



Photograph: Centennial Park beach



Photograph: Talcy Park, Ville d'Anjou

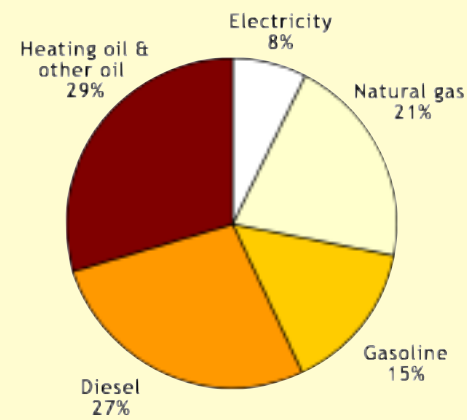




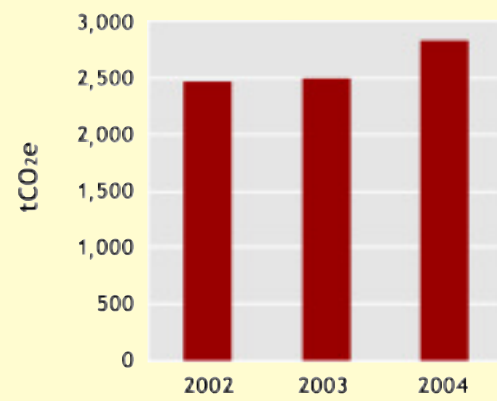
## Côte-Saint-Luc–Hampstead– Montréal-Ouest

Contribution to  
corporate  
emissions  
**1.5%**

GHG emissions by energy source in 2004



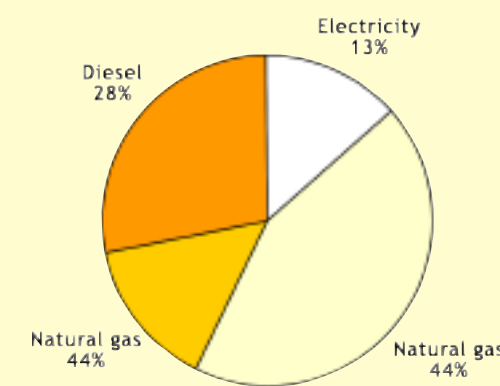
History of corporate emissions



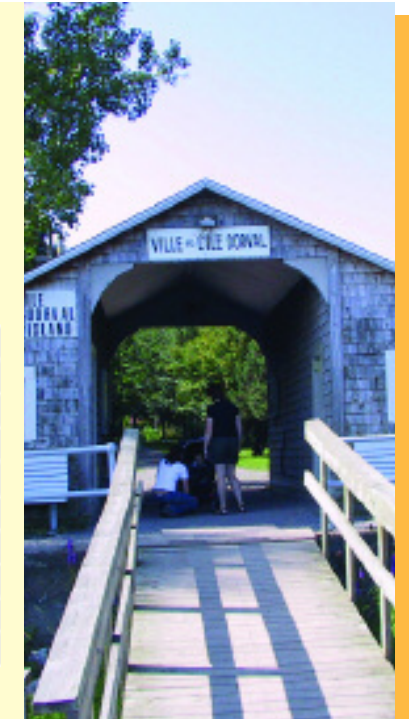
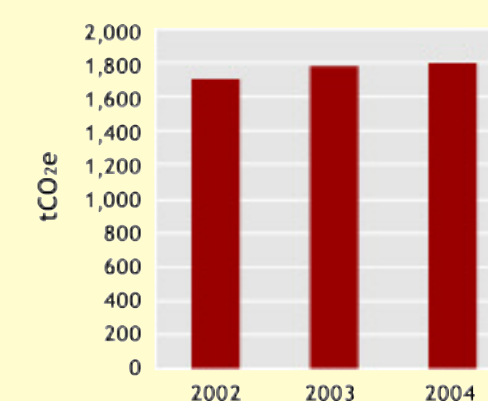
## Dorval–Île-Dorval

Contribution to  
corporate  
emissions  
**1%**

GHG emissions by energy source in 2004



History of corporate emissions

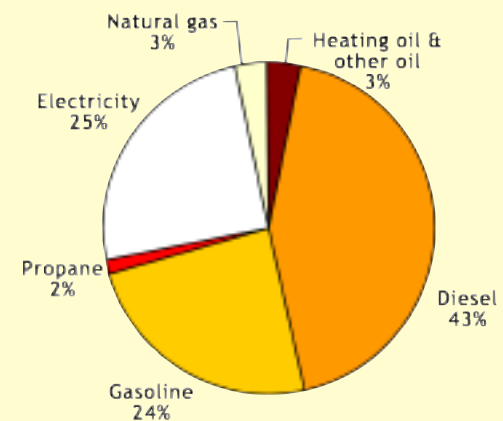


Photograph: Dorval Island landing

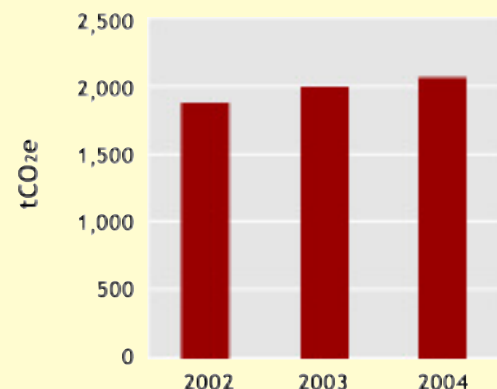
## Dollard-des-Ormeaux–Roxboro

Contribution to  
corporate  
emissions  
**1.1%**

GHG emissions by energy source in 2004



History of corporate emissions

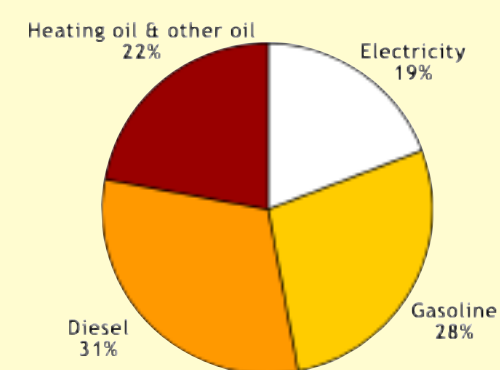


Photograph: Centennial Lake

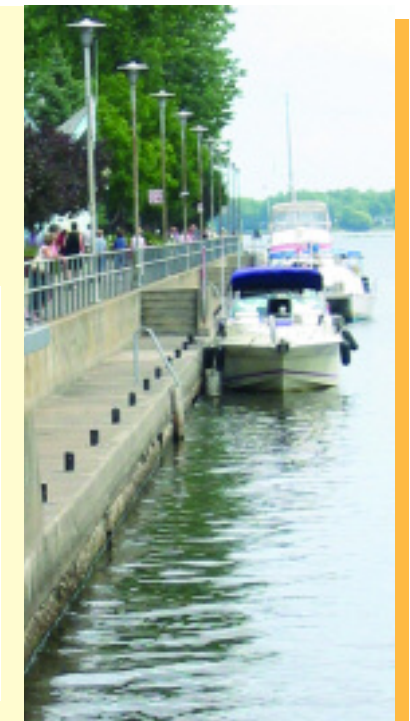
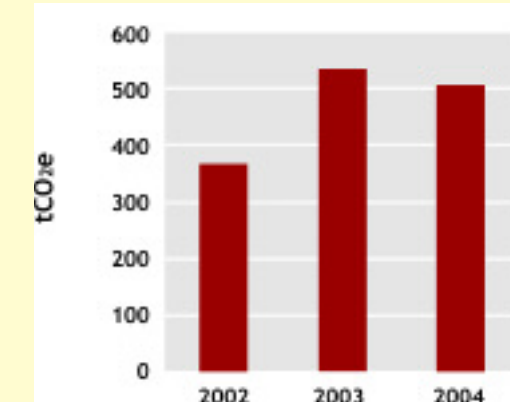
## Île-Bizard–Sainte-Genève– Sainte-Anne-de-Bellevue

Contribution to  
corporate  
emissions  
**0.3%**

GHG emissions by energy source in 2004



History of corporate emissions



Photograph: Sainte-Anne-de-Bellevue locks



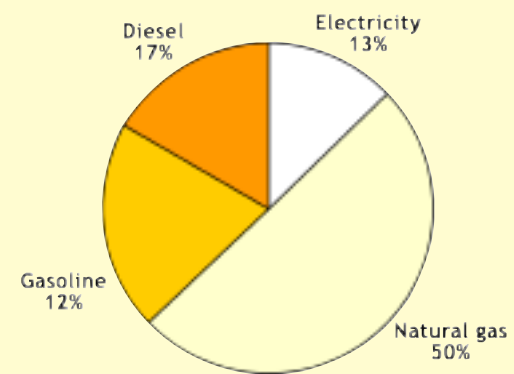
## Kirkland

No data provided

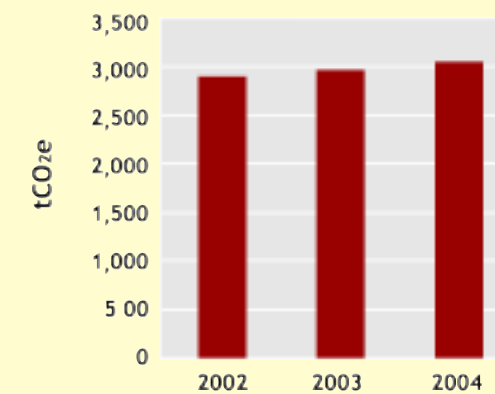
## LaSalle

Contribution to corporate emissions  
1.6%

GHG emissions by energy source in 2004



History of corporate emissions

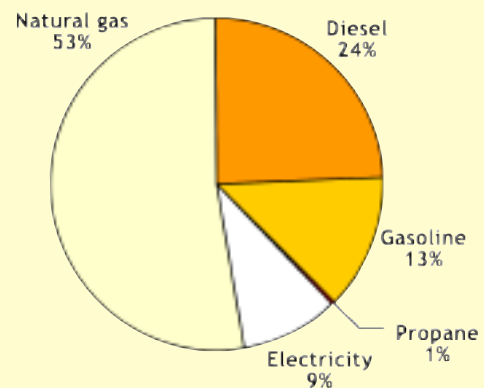


Photograph: Ranger Park

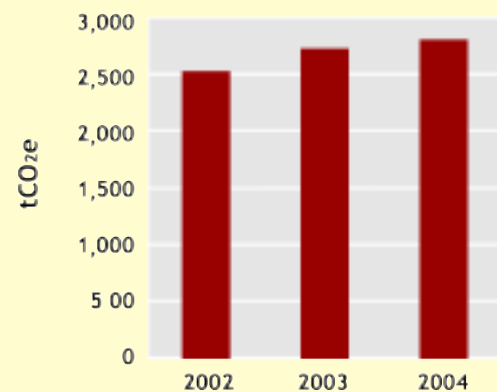
## Lachine

Contribution to corporate emissions  
1.5%

GHG emissions by energy source in 2004



History of corporate emissions

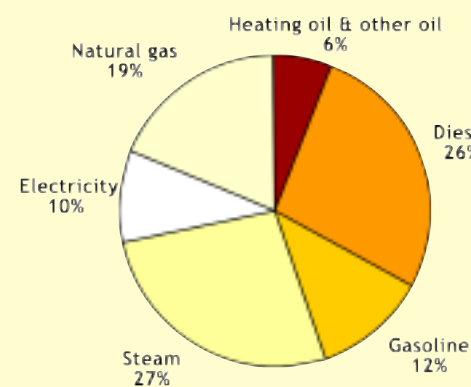


Photograph: Summerlea Park

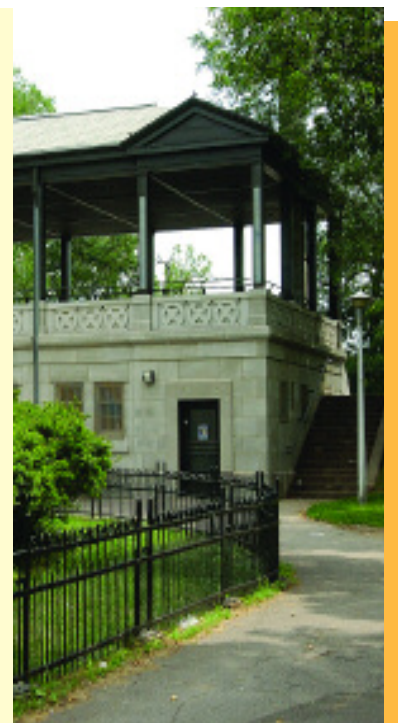
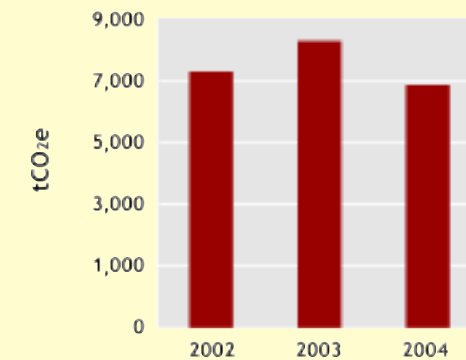
## Mercier-Hochelaga-Maisonneuve

Contribution to corporate emissions  
3.7%

GHG emissions by energy source in 2004



History of corporate emissions



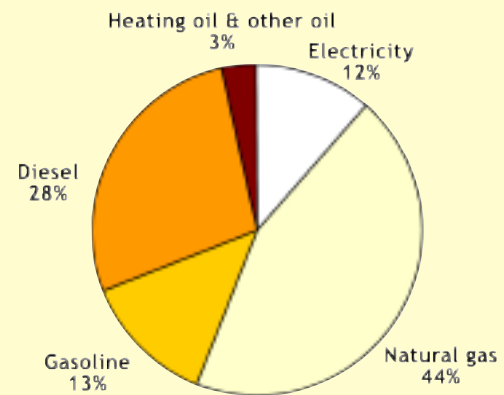
Photograph: Morgan Park, Mercier-Hochelaga-Maisonneuve borough



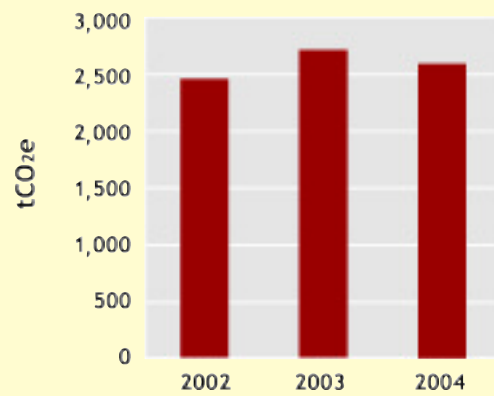
## Montréal-Nord

Contribution to corporate emissions  
**1.4%**

GHG emissions by energy source in 2004



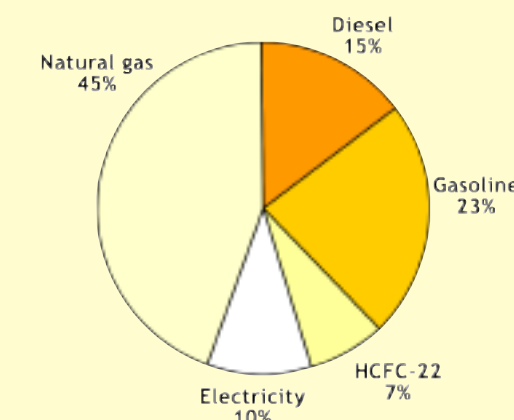
History of corporate emissions



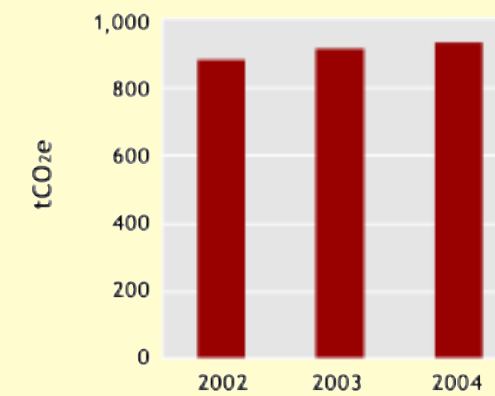
## Outremont

Contribution to corporate emissions  
**0.5%**

GHG emissions by energy source in 2004



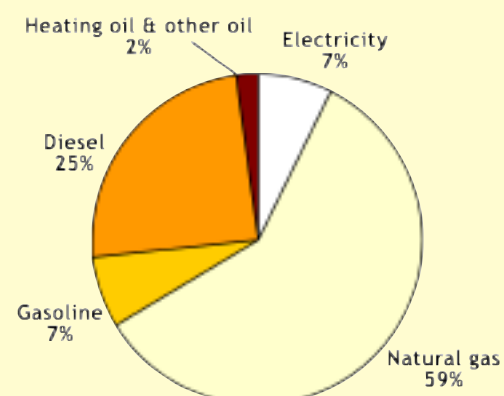
History of corporate emissions



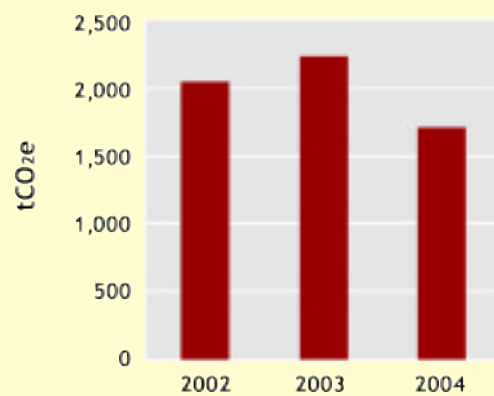
## Mont-Royal

Contribution to corporate emissions  
**0.9%**

GHG emissions by energy source in 2004



History of corporate emissions

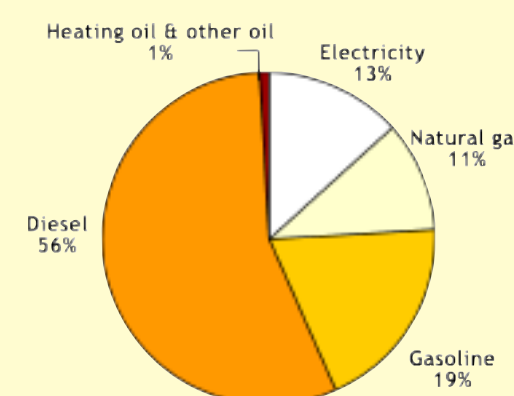


Photograph: Beaver Lake

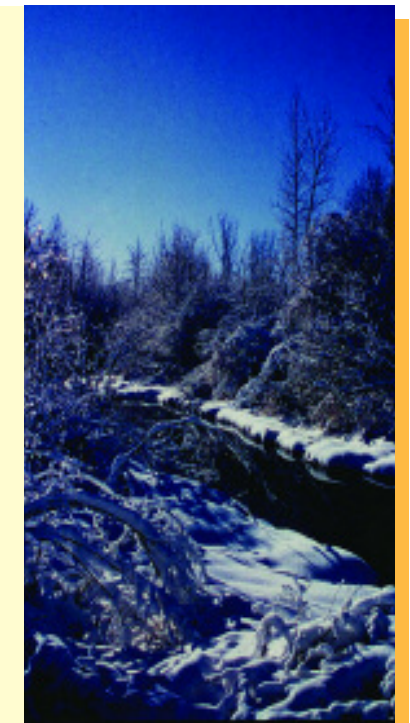
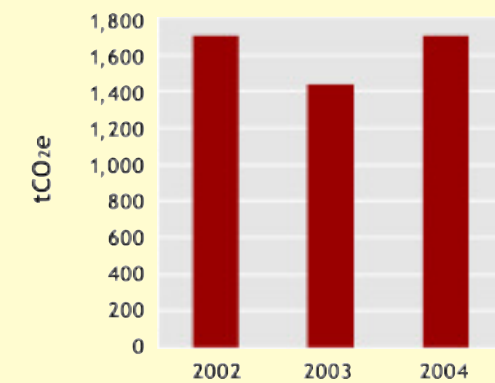
## Pierrefonds–Senneville

Contribution to corporate emissions  
**0.9%**

GHG emissions by energy source in 2004



History of corporate emissions



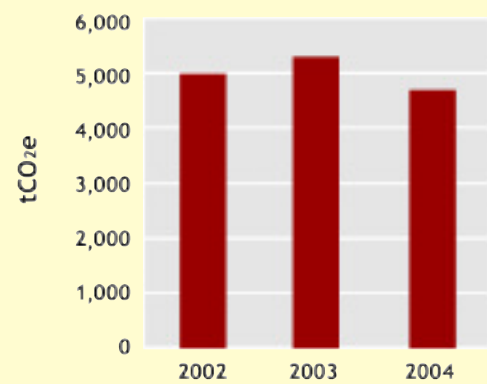
Photograph: Bois-de-Liesse Nature Park, Pierrefonds–Senneville borough



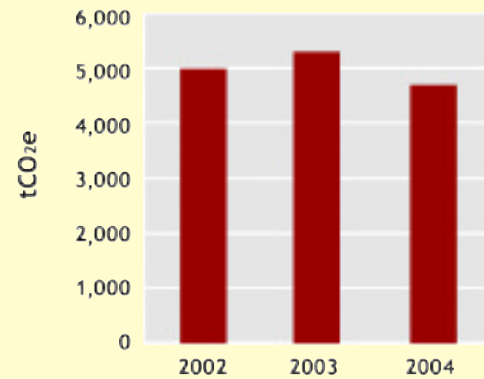
## Le Plateau-Mont-Royal

Contribution to corporate emissions  
**2.5%**

GHG emissions by energy source in 2004



History of corporate emissions

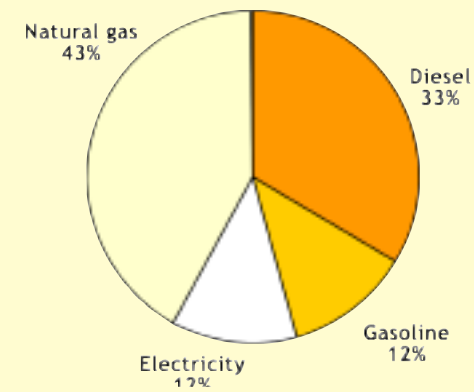


Photograph: De Brébeuf bicycle path, taken by Denis Labine, City of Montréal

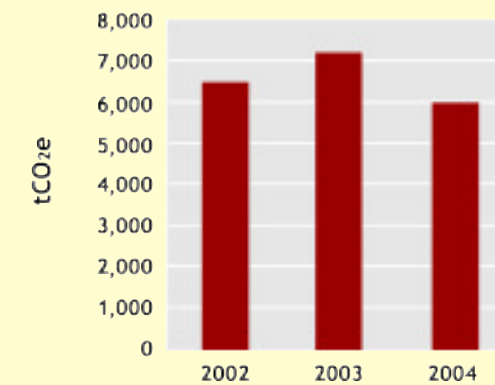
## Rivière-des-Prairies– Pointe-aux-Trembles–Montréal-Est

Contribution to corporate emissions  
**3.2%**

GHG emissions by energy source in 2004



History of corporate emissions

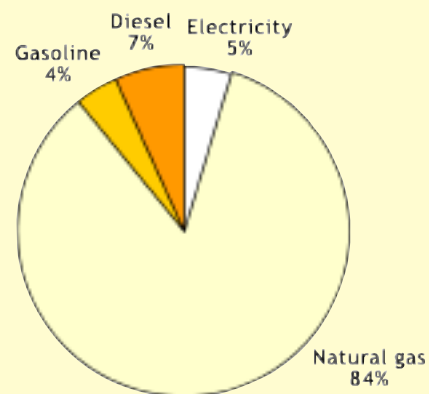


Photograph: Borough celebration, Rivière-des-Prairies–Pointe-aux-Trembles borough

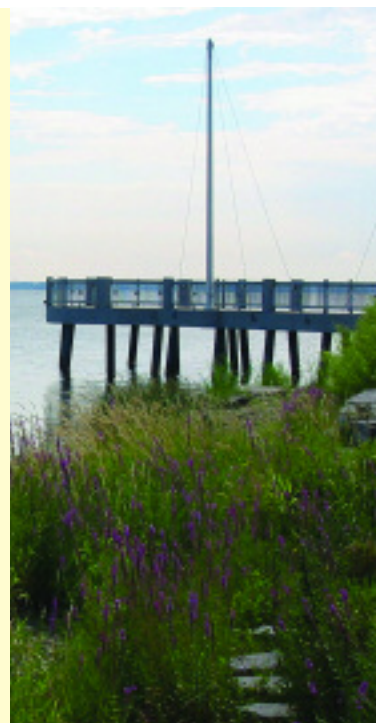
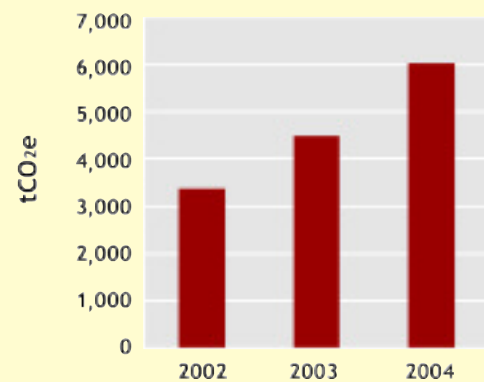
## Pointe-Claire

Contribution to corporate emissions  
**3.2%**

GHG emissions by energy source in 2004



History of corporate emissions

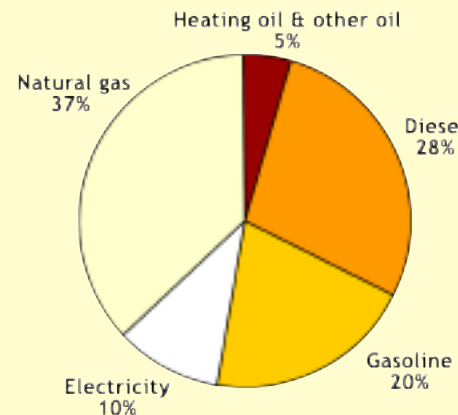


Photograph: Edgewater Park

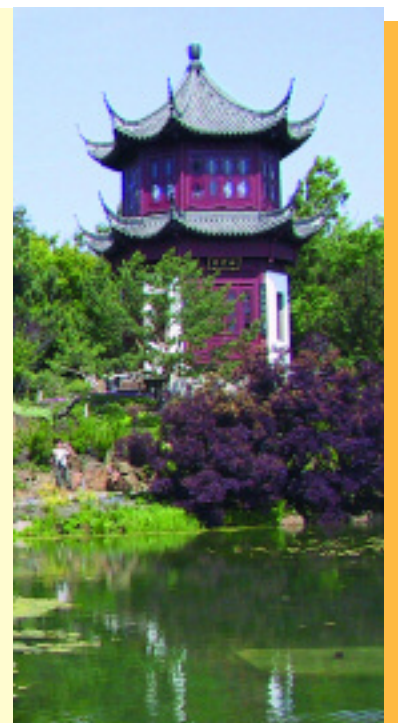
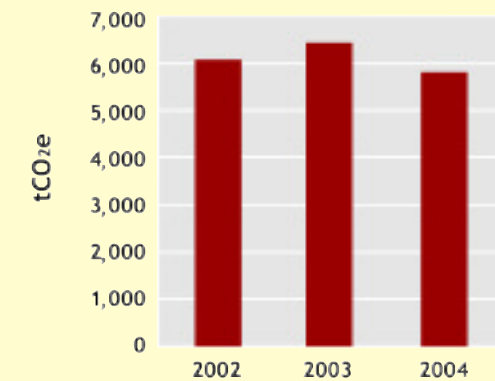
## Rosemont–La Petite-Patrie

Contribution to corporate emissions  
**3.1%**

GHG emissions by energy source in 2004



History of corporate emissions



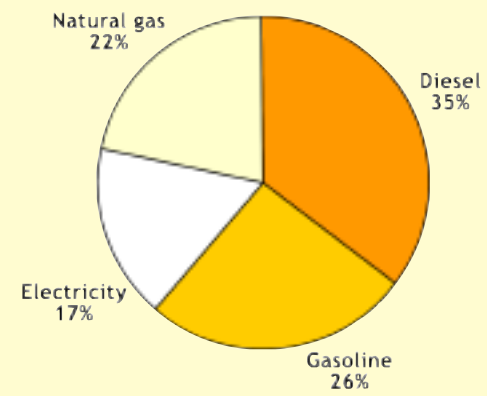
Photograph: Botanical Garden



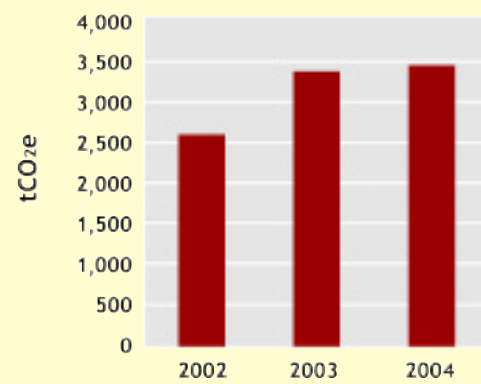
## Saint-Laurent

Contribution to corporate emissions  
**1,8 %**

GHG emissions by energy source in 2004



History of corporate emissions

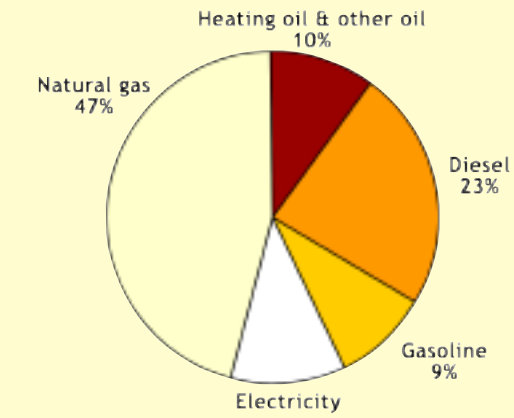


Photograph: Dr.-Bernard-Paquet Park

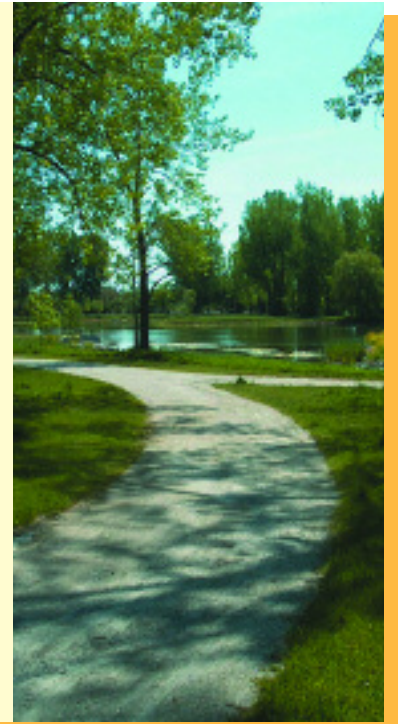
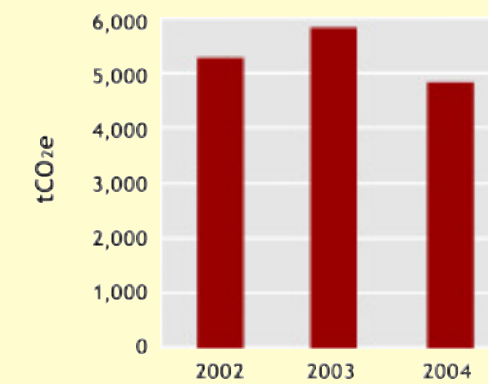
## Le Sud-Ouest

Contribution to corporate emissions  
**2.5%**

GHG emissions by energy source in 2004



History of corporate emissions

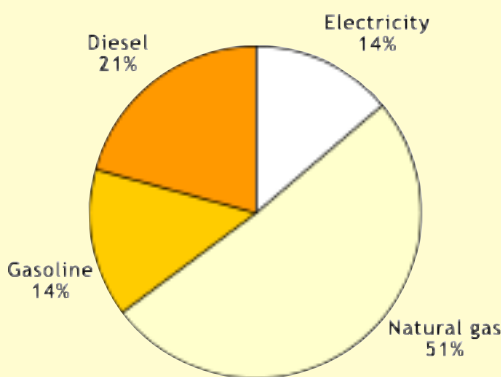


Photograph: Angrignon Park, Sud-Ouest borough

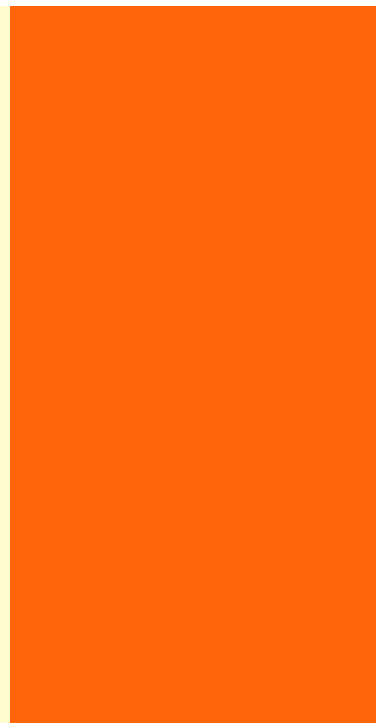
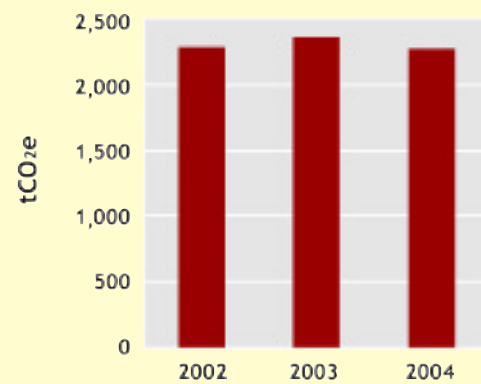
## Saint-Léonard

Contribution to corporate emissions  
**1.3%**

GHG emissions by energy source in 2004



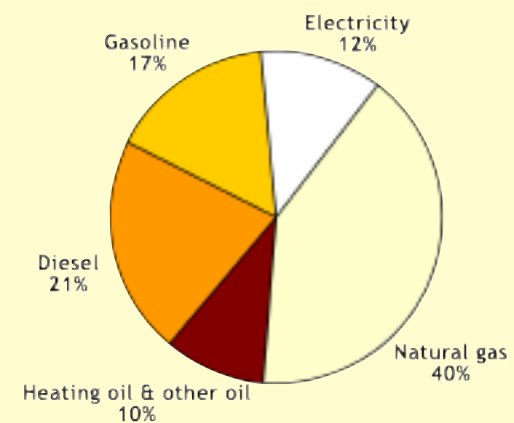
History of corporate emissions



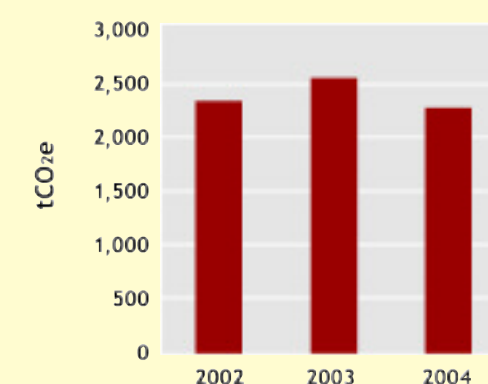
## Verdun

Contribution to corporate emissions  
**1.2%**

GHG emissions by energy source in 2004



History of corporate emissions



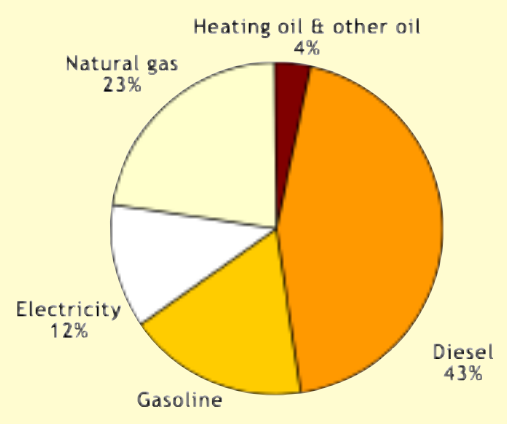
Photograph: La Ronde



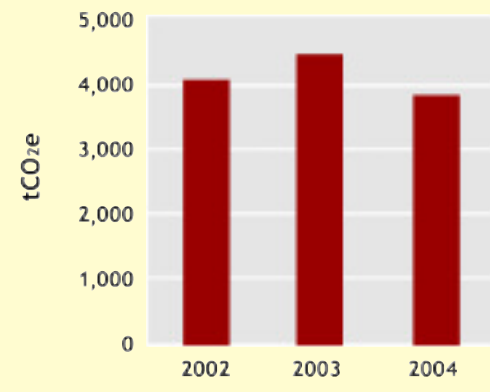
## Ville-Marie

Contribution to corporate emissions  
**2.1%**

GHG emissions by energy source in 2004



History of corporate emissions

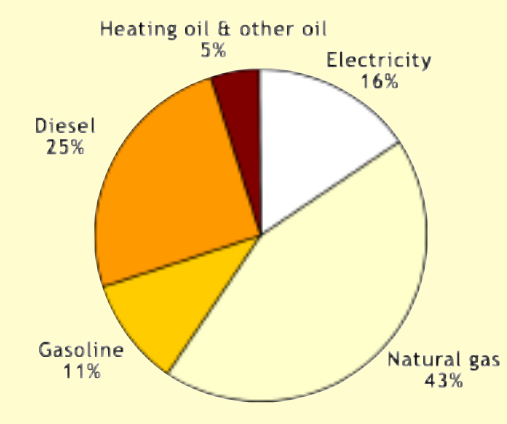


Photograph: Old Port of Montréal

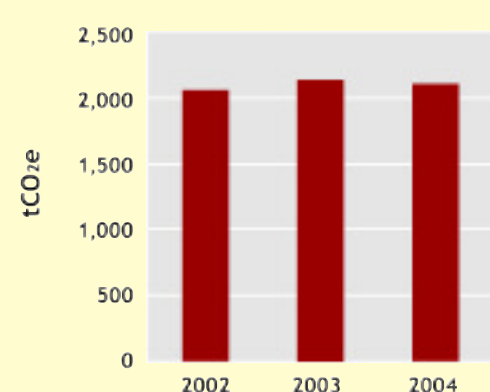
## Westmount

Contribution to corporate emissions  
**1.2%**

GHG emissions by energy source in 2004



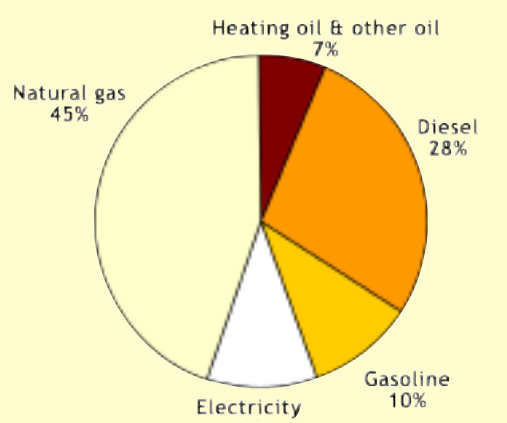
History of corporate emissions



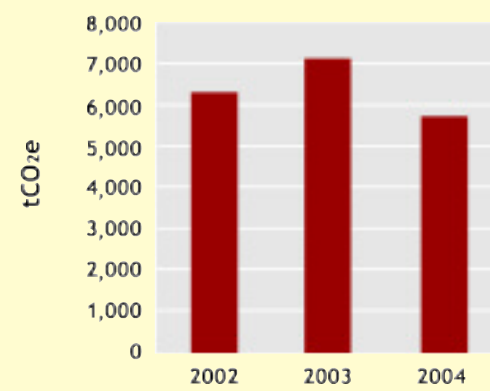
## Villeray–Saint-Michel–Parc-Extension

Contribution to corporate emissions  
**3%**

GHG emissions by energy source in 2004



History of corporate emissions



Photograph: Athena Park, City of Montréal



# Conclusion

The corporate inventory of municipal activities on the island of Montréal represents only about 1.4% of the community's emissions. It totalled 192 ktCO<sub>2</sub>e in 2002, 199 ktCO<sub>2</sub>e in 2003 and 184 ktCO<sub>2</sub>e in 2004. In other words, GHG emissions from municipal services were relatively stable.

This inventory can be used to guide, encourage and sustain action and to compare emissions in the medium term (at intervals of a few years each).

Municipal emissions have three main sources:

- buildings (42%)
- vehicles (28%)
- wastewater treatment plant (18%)

From an administrative point of view, these emissions are divided almost equally between the boroughs and reconstituted cities and the central units (wastewater treatment, police, museums, etc.). From an energy standpoint, 41% of GHG emissions come from the consumption of natural gas. Electricity, diesel and gasoline are each responsible for about 14% of GHG emissions.

When it comes to greenhouse gases, reducing the energy consumption of cities while maintaining the same level of service is a first challenge for municipal administrations. The second is using the knowledge we have to reduce the community's GHG emissions. This may be a tall order, but it is essential.



# Recommendations

- Collection, compilation and presentation of the inventory data were heavily influenced by the structure of the city at the time of the inventory. This structure underwent deep changes with the reconstitution of 15 cities on the island and the modification of some boroughs. Future inventories will have to take these structural changes into account.
- Insofar as possible, data should be disaggregated to separate the emissions generated by the various administrative units, so that each unit can be held accountable for its share of the inventory.
- Obtaining all the invoices for Gaz Métro, Hydro-Québec, refrigerant gases and fuel from the 15 reconstituted cities, 19 boroughs and dozen central units was a colossal task. Some values had to be estimated, for lack of information. It is therefore important for each administrative unit to manage its own energy consumption and set up procedures for keeping and tracking invoices.
- Energy management requires that these invoices be allocated to a single usage rather than a group (such as a group of buildings).
- Future inventories will provide a unique opportunity for collecting energy data on municipal services. They will serve as a valuable tool for establishing energy performance indicators and realizing energy savings.
- The expertise, tools and experience developed by the City of Montréal should be made available to paramunicipal organizations to help them carry out their own inventories.

# Abbreviations

CO<sub>2</sub>: Carbon dioxide

CO<sub>2</sub>e: Carbon dioxide equivalent

FCM: Federation of Canadian Municipalities

GHG: Greenhouse gas

IRR: Internal rate of return

kt: Kilotonne (metric)

t: Tonne (metric)

IPP: Investment payback period

IRR: Internal rate of return

MFSPSD: *Montréal's First Strategic Plan for Sustainable Development*

SMEC: Saint-Michel Environmental Complex

UNFCCC: United Nations Framework Convention on Climate Change

# Photographs



## Volume 2

Beauséjour Park,  
Ahuntsic-Cartierville  
Photograph: RSMA



## Foreword

Car-free Day  
Photograph: RSQA



## Table of Contents

Jean-Drapeau Park, Ville-Marie  
Photograph: RSMA



## Chapter 1

Dr.-Bernard-Paquet Park,  
Saint-Laurent  
Photograph: RSMA



## Chapter 2

Angrignon Park, Le Sud-Ouest  
Photograph: RSMA



## Chapter 3

Downtown  
Photograph: RSMA



## Chapter 4

Jacques-Cartier Bridge  
Photograph: RSMA




## Conclusion

Centennial Park, Beaconsfield  
Photograph: RSMA

# Appendix 1

## Resolution CE05 5020 of November 23, 2005

Extrait authentique du procès-verbal d'une séance du comité exécutif

		Séance tenue le 23 novembre 2005 Numéro de la résolution CE05 5020
Numéro de dossier : 1052591002		
<b>Unité administrative responsable</b>	Infrastructures / transport et environnement, Direction de l'environnement, Division de la planification et du suivi environnemental	
<b>Objet</b>	Fixer un objectif de 20 % de réduction des émissions corporatives de gaz à effet de serre (GES) de la Ville sur la période 2002-2012 et mandater le directeur général adjoint du Service des infrastructures, transport et environnement (SITE) pour coordonner la réduction des émissions de GES et la mise en œuvre des mesures d'adaptation aux changements climatiques avec les services et arrondissements concernés.	
<b>Résultat</b> Adopté Dissidence	<b>Commentaires</b>	

Il est

### RÉSOLU

- 1- de fixer l'objectif de réduction des émissions corporatives de gaz à effet de serre de 20 % pour la période 2002-2012;
- 2- de mandater le directeur général adjoint du Service des infrastructures, transport et environnement (SITE) pour :
  - superviser la collecte des données nécessaires à l'inventaire des gaz à effet de serre (GES) et coordonner la réduction des émissions de GES;
  - coordonner la mise en œuvre des mesures d'adaptation aux changements climatiques;
  - soumettre un rapport annuel de synthèse, le tout en collaboration avec les services et arrondissements concernés.

Adopté à l'unanimité.

1052591002  
12.03  
lc

# Appendix 2

## List of emission factors

### Fuel emission factors for buildings

Fuel	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	Units
Natural gas	1,880	0.043	0.020	g/m <sup>3</sup>
No. 2 fuel oil	2,830	0.026	0.013	g/L
No. 6 fuel oil	3,090	0.060	0.013	g/L
Propane	1,530	0.030	0.000	g/L
Steam	0	0	0	-
Biomass (wood)	1,500	0.150	0.160	g/kg
Electricity (Quebec)	0,022			kg CO <sub>2</sub> /kWh

### Conversion factors

Fuel		m <sup>3</sup>	k.m <sup>3</sup>	L	kL	kg	t	MJ	GJ
Natural gas	m <sup>3</sup>	1	1,000	N/P	N/P	N/P	N/P	0.03	26.39
No. 2 fuel oil	L	N/P	N/P	1	1,000	N/P	N/P	0.03	25.85
No. 6 fuel oil	L	N/P	N/P	1	1,000	N/P	N/P	0.02	23.96
Propane	L	N/P	N/P	1	1,000	N/P	N/P	0.04	39.17
Steam	GJ	N/P	N/P	N/P	N/P	N/P	N/P	0	1
Biomass (wood)	kg	N/P	N/P	N/P	N/P	1	1,000	0.06	55.55
Cooled water		N/P	N/P	N/P	N/P	N/P	N/P		

### Equivalency factors for refrigerant gases

Gas	100-year equivalency factor
CFC-11	4,000
CFC-12	8,500
CFC-13	11,700
CFC-113	5,000
CFC-114	9,300
CFC-115	9,300
Halon 1301	5,600
HCFC-22	1,700
HCFC-123	93
HCFC-124	480
HCFC-141b	630
HCFC-142b	2,000
HCFC-225ca	170
HCFC-225cb	530
HFC-23	11,700
HFC-32	650



### Equivalency factors for refrigerant gases (cont.)

Gas	100-year equivalency factor
HFC-41	150
HFC-43-10mee	1,300
HFC-125	2,800
HFC-134	1,000
HFC-134a	1,300
HFC-143	300
HFC-143a	3,800
HFC-152a	140
HFC-227ea	2,900
HFC-236ea	100
HFC-236fa	6,300
HFC-245ca	560
FX-40	3,035
R-401A	1,082.4
R-401B	1,186.8
R-401C	831.6
R-402A	2,326
R-402B	2,084
R-403A	2,675
R-403B	3,682
R-404A	3,260
R-405A	4,582.3
R-406A	1,755
R-407A	1,770
R-407B	2,285
R-407C	1,525.5
R-408A	2,743
R-409A	1,440
R-410A	1,725
R-410B	1,832.5
R-411A	1,502.9
R-411B	1,602.2
R-412A	2,040
R-413A	1,774
R-414A	1,333.8
R-414B	1,227.2
R-500	6,309.68
R-501	3,400
R-502	5,591.2
R-503	11,700
R-504	5,130.7
R-507	3,300

### Equivalency factors for refrigerant gases (cont.)

Gas	100-year equivalency factor
R-508A	10,175
R-508B	10,350
R-509	4,668
Oxyfume 88/12	7,480

### Emission factors for vehicle fuels

Gasoline	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	Units
Cars	2,360	0.25	0.21	g/L
Light trucks	2,360	0.19	0.39	g/L
Heavy vehicles	2,360	0.17	1.00	g/L
Véhicules tout terrain	2,360	3.00	0.06	g/L
Motorcycles	2,360	1.40	0.05	g/L

Diesel	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	Units
Cars	2,730	0.05	0.10	g/L
Light trucks	2,730	0.07	0.10	g/L
Heavy vehicles	2,730	0.12	0.10	g/L
All terrain vehicles	2,730	0.14	1.10	g/L

Gaz naturel	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	Units
Natural gas vehicles	1.88	0.022	0.00006	g/L

Propane	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	Units
Propane vehicles	1,530	0.70	0.09	g/L

Ethanol fuel (E5)	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	Units
Cars	2,242	0.12	0.26	g/L
Light trucks	2,242	0.22	0.41	g/L
Heavy vehicles	2,242	0.17	1.00	g/L
All terrain vehicles	2,242	2.70	0.05	g/L
Motorcycles	2,242	1.40	0.05	g/L

Ethanol fuel (E10)	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	Units
Cars	2,124	0.12	0.26	g/L
Light trucks	2,124	0.22	0.41	g/L
Heavy vehicles	2,124	0.17	1.00	g/L
All terrain vehicles	2,124	2.70	0.05	g/L
Motorcycles	2,124	1.40	0.05	g/L