



INFORMATION REPORT

TO: Mayor and Members Board of Health	WARD(S) AFFECTED: CITY WIDE
COMMITTEE DATE: October 15, 2012	
SUBJECT/REPORT NO: Climate Change Actions 2011 (BOH12029) (City Wide)	
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SIGNATURE:	

Council Direction:

In 2008, the City adopted Corporate emission targets of a 10% reduction of 2005 greenhouse gases levels by 2012, followed by a further 20% reduction of 2005 greenhouse gases levels by 2020 under the Corporate Air Quality and Climate Change Strategic Plan (PED06336(a)). Community targets were established of a 10% reduction of 2006 greenhouse gases levels by 2012 followed by a further 20% reduction of 2006 greenhouse gases levels by 2020.

In 2011, the City of Hamilton endorsed and signed the Hamilton Community Climate Change Action Charter (PED 11150). The Hamilton Climate Change Action Charter is a voluntary agreement that outlines the need for local action and a commitment to take action on climate change from individuals, organizations and businesses of all types and sizes in Hamilton.

This report provides an update with regards to progress by the Corporation in 2011 and by the community in 2010 on reducing greenhouse gas emissions and meeting these targets and commitments under the Hamilton Community Climate Change Action Charter.

Information:

Climate Change, Public Health and Cities:

Cities are major contributors of carbon emissions. According to the Organisation for Economic Co-operation and Development (2010), cities are home to more than 50% of the world population, contribute to about 70% of worldwide emissions, and use 2/3 of the total energy worldwide. Urbanisation can be seen as a driver for emissions on a per-capita and total greenhouse gas emissions.

Urban households, industries, transportation, and infrastructures within them are key sources of greenhouse gases. Urban areas concentrate populations, economic activities and built environments, thus increasing the risk of events that could adversely impact public health. Examples of these events include, but are not limited to: floods and droughts; heat waves; increased production of secondary air pollutants that can lead to increased smog. These environmental conditions can lead to increases in adverse health effects such as increased vector-borne and food-borne diseases in the case of floods and droughts; increased heat stress on the cardiovascular system in the case of heat waves, and; increased respiratory disease exacerbations in the case of smog.

Factors that shape the levels of greenhouse gas emissions in cities include:

- Geography
- Demographics
- Urban form and density
- Urban economy
- Consumption patterns of residents

Cities are considered to be the drivers of action on addressing climate change through municipal practices and regulations in their own operations and the services they provide to their communities. Cities are economic engines and climate change will influence those activities from innovation on actions and solutions to energy, transportation, buildings, health, air quality and climate.

Successful cities recognize the synergy between economic growth and climate change is strongest at the local level. Cities that address greenhouse gas emissions also curb local pollution and energy demands – while metro regions that continue to pollute, risk becoming less attractive for investment. Similarly, cities that build resilience into their climate change and energy actions, increase the security of local populations to extreme weather events, which can enhance local safety, health and the quality of life of citizens.

Addressing climate change requires two types of actions: adaptation and mitigation. Adaptation involves actions or planning to minimize citizens or infrastructure's vulnerabilities to the impacts of climate change. Mitigation involves actions aimed at reducing greenhouse gases. Adaptation and mitigative actions are complimentary.

To date, responses to reducing (mitigating) climate change in cities globally can be grouped into five sectors:

1. *Urban Development and Design* (e.g. land-use planning, regeneration and re-use of lands and buildings, increased density to reduce mobility demand, and promote walking and cycling)
2. *The Built Environment* (e.g. energy efficient materials and design, retrofitting, energy demand reduction, alternative energy promotion)
3. *Transportation* (e.g. mass transportation using transit, energy efficient hybrid and electric vehicles)
4. *Urban Infrastructures* (e.g. renewable and low carbon energy sources, waste recycling)
5. *Carbon Sequestration* (e.g. tree planting and maintenance, protection of wetlands)

Climate Change Mitigation - Corporate Emission Reductions:

The Corporation has reduced its emissions by 16% (113,778 tonnes) in 2011 compared to the 2005 emissions of 135,038 tonnes. This indicates that the City has exceeded it's 2012 targets and is closing in on it's 2020 targets. The overall trend over the past five years has shown emissions declining as show in **Figure 1**.

Figure 1: Municipal Emissions Yearly Trends: 2005 – 2011

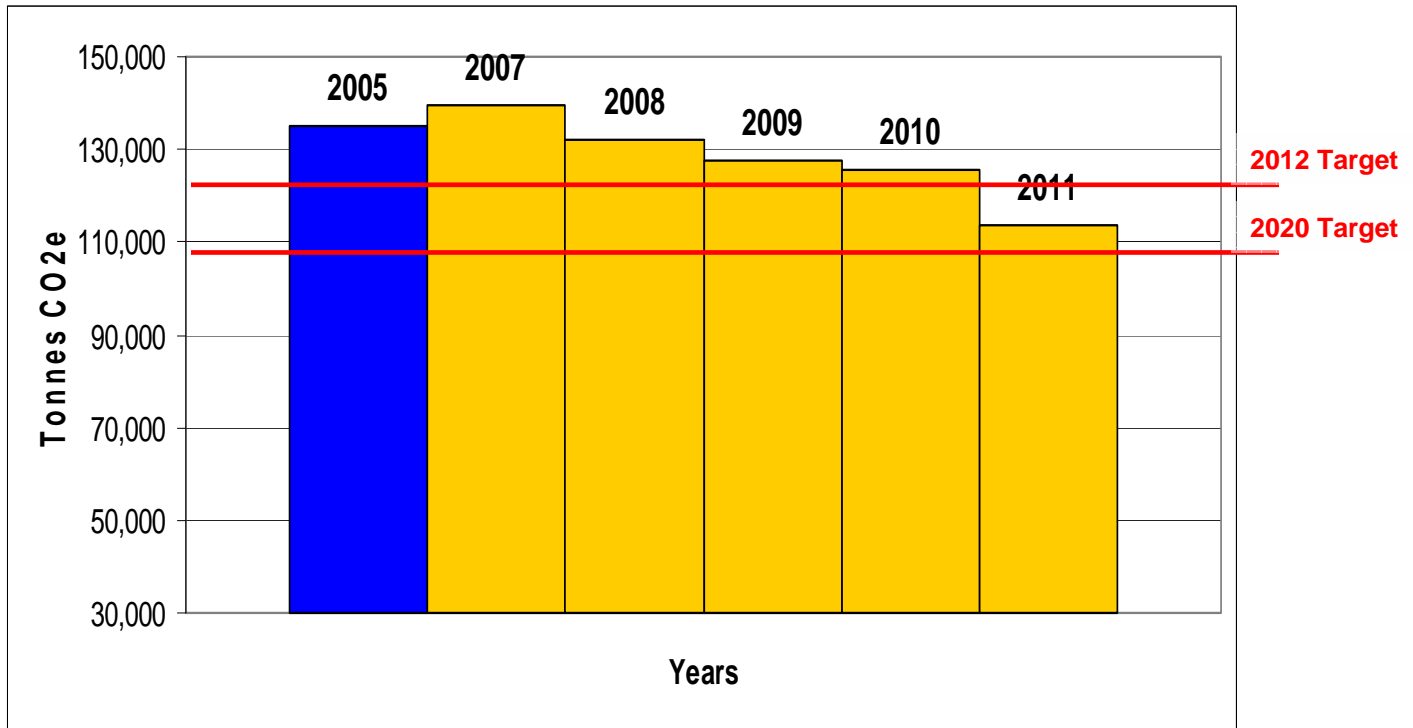
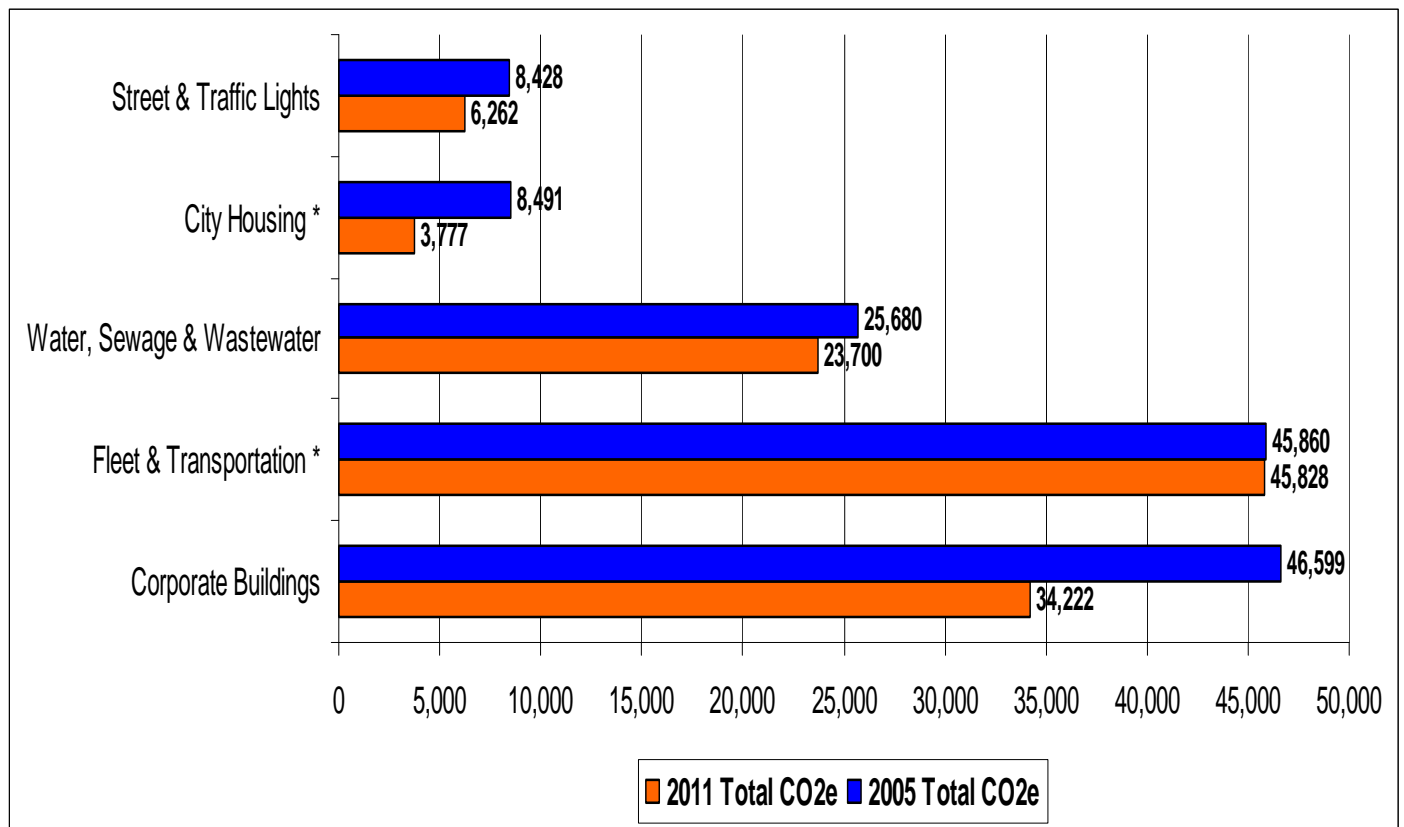


Figure 2: Corporate Reductions on Greenhouse Gas Emissions: 2005 – 2011



As shown in **Figure 2**, significant reductions have been made through energy conservation and efficiency in Corporate buildings, street and traffic lighting, and water and wastewater¹. Since 2005, the City has reduced its energy intensity of building operations by 14% passing the 2012 targets of 7.5% and moving forward to achieving the 2020 targets of a 20% reduction (PW12025). These reductions have been made through projects such as the Downtown District Cooling System² and efficient lighting and energy control systems in arenas, libraries, fire stations and corporate buildings.

Further reductions of greenhouse gas emissions and increased energy savings are expected in 2013 with the installation of a roof-mounted solar photovoltaic (PV) system at the City’s operations centre located at 330 Wentworth Street North. This pilot project

¹ In 2011, actual electricity consumption from City Housing was captured in the Inventory. This data represented approximately 20% of the City Housing stock. Further electrical and natural gas data is encouraged for future reporting and emissions tracking.

² Downtown locations served by the district cooling system include: City Hall, Copp’s Coliseum, Lister Block, Central Library, Hamilton Wentworth School Board/McMaster Building, Hamilton Place, Hamilton Convention Centre, Ellen Fairclough Building, Farmers Market and Art Gallery.

is the third major renewable energy generation initiative the City has implemented since 2006. The City's co-generation plants at the Woodward Wastewater Treatment Plant (WWTP) and Glanbrook are the other two City-owned and operated renewable energy initiatives.

The City's WWTP implemented a 1.6MW co-generation facility fueled entirely by methane sourced from the anaerobic digestion of sewage sludge treated at the plant in 2007. The treatment plant captures methane and converts it to energy and reduces greenhouse gas emissions.

In 2011, the Woodward Avenue high lift pumping station had its old pumps, motors and switchgears replaced with state-of-the-art equipment. The resulting energy savings and reductions of greenhouse gases of this project will be captured in the 2012 inventory.

The City also operates a 3.2MW Glanbrook cogeneration landfill site facility that captures methane and converts it to energy.³ 2010 data shows a 92% reduction in emissions from 120,414 tonnes in 2005 to 9,071 tonnes in 2011 from capturing of methane emissions.

Unfortunately, reductions in transportation emissions are not clear. Fuel usage by City fleet appear to have increased in 2011 due to increased travel distance and demands for City business and program delivery by staff.

Emissions associated with employee commuting habits have not changed since the inventory was begun, due to a gap in the availability of data to measure actions. The City has a number of transportation demand management programs available to employees to reduce emissions (secure bicycle parking, employee transit passes, car pooling, car sharing) (PW11069). Unfortunately, these programs do not capture measurable data in emissions reductions from participants. Smart Commute Hamilton should consider undertaking a survey and inventory of City of Hamilton employees active and sustainable commuting habits (such as transit, cycling, walking, carpooling) to determine the emissions reduction achievements achieved by the City.⁴

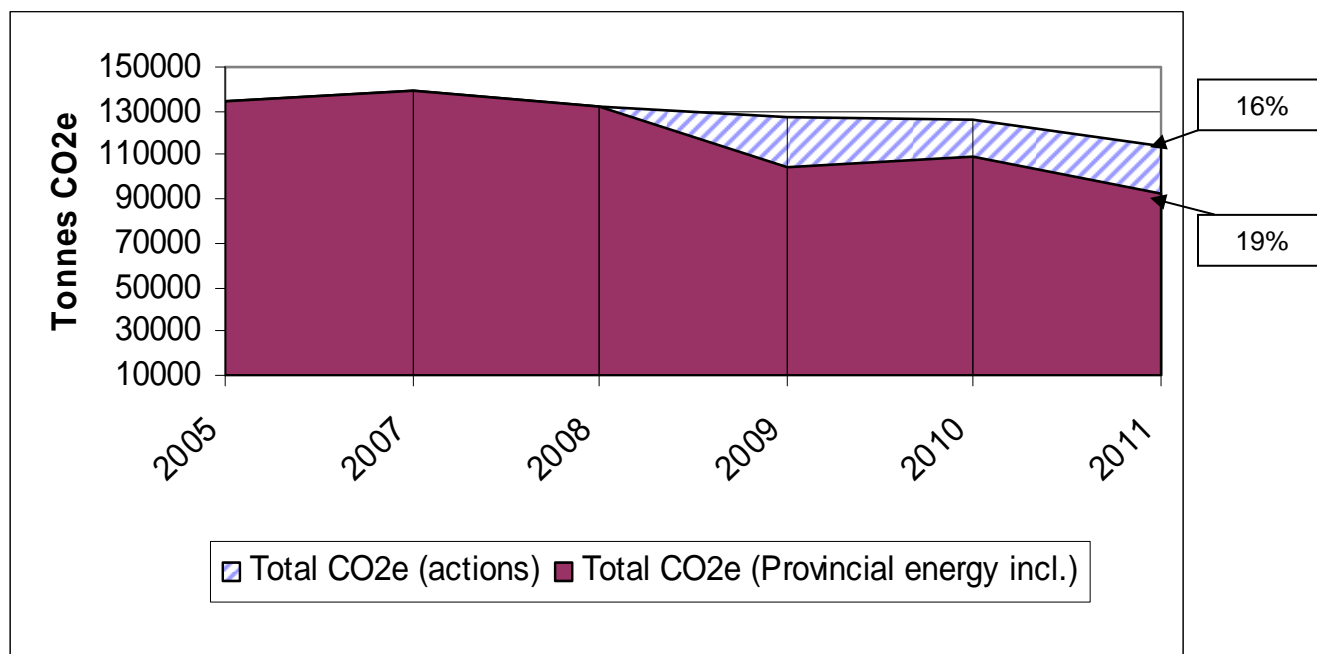
The province of Ontario's movement away from coal-based power toward greener energy options compliments climate change initiatives in City operations and facilities and in the broader community. A comparison of City actions with and without the changing energy mixture shows the co-benefits of actions and encouraging green energy resulting in the City exceeding its 2010 reduction targets of 10% by 2012 and getting close to meeting its 2020 targets of a 20% reduction in 2011.

³ Although the operation of the Glanbrook Landfill is owned and operated by the City and is considered a Corporate operation, International Greenhouse Gas Standard Protocols require that Municipal and privately owned and operated landfills be considered in the community inventory.

⁴ At the time of the writing of this report, a 2012 employee survey of commuting habits was under investigation by City Staff and Smart Commute Hamilton.

However, energy mixture and usage fluctuates on a year-by-year basis.⁵ **Figure 3** separates Corporate actions from the Provincial energy mixture to identify where the Corporation’s actions alone are resulting in emissions reductions. **Figure 3** highlights the co-benefits of the Province’s green energy movement which improves emissions across the Corporation and in the community. Although the data illustrates the Corporation as meeting its targets, additional actions are required to further reduce emissions.

Figure 3: Corporate Actions on Greenhouse Gas Emissions (with and without the Provincial Energy mixture)



The 2011 drop in emissions has been heavily influenced by a reduced demand for electrical energy due to energy conservation, peak demand pricing and the movement away from coal-generated energy sources. Overall in Ontario, total energy demand was -0.35% (141.5 TWh⁶) in 2011 and 2.2% (144 TWh) in 2010 compared to -3.8% (151 TWh) in 2006. The 2011 Provincial energy mixture (**Table 1**) showed coal generated energy dropping to 3.0% compared to 14.5% in 2008.

⁵ From 2005 to 2011, the average emission factor associated with the generation of electricity in the Province decreased from 0.00021 to 0.00010 t CO2e/kWh. On an annual basis, these emission factors can change substantially. Therefore, these changes must be considered when interpreting the changes in emissions from year to year for sources consuming electricity.

⁶ TWh = terawatt hour or 10¹²

Table 1: Ontario Energy Mixture 2008 to 2011 by Percentage

Year	Nuclear	Hydro	Coal	Gas	Wind & Other
2011	57.0 %	22.0 %	3.0 %	15.0 %	3.4 %
2010	55.0 %	20.4 %	8.3 %	13.6 %	2.7 %
2009	55.2 %	25.5 %	6.6 %	10.3 %	2.4 %
2008	53.0 %	24.1 %	14.5 %	6.9 %	1.5 %

Source: <http://www.ieso.ca/>

In 2006, the Provincial energy mixture showed nuclear facilities provided the majority of supply for Ontario at 84.4 terawatt hours (TWh), or 54%. The portion of Ontario's electricity production from hydroelectric generators was 22%, or 34.8 TWh. Generation from coal-fired facilities accounted for 16% of all Ontario generation or 25 TWh. Other fuels, including oil, gas and alternative sources, supplied the remaining 8%, or 11.8 TWh, of the Province's electricity output. Compared to 2006, coal generated energy is decreasing while nuclear, hydro, natural gas, wind and other sources are increasing resulting in some reductions of harmful air and greenhouse gas pollutants.

Energy demand, conservation and changes in energy sources in 2012 suggest further expected emission reductions to the community.

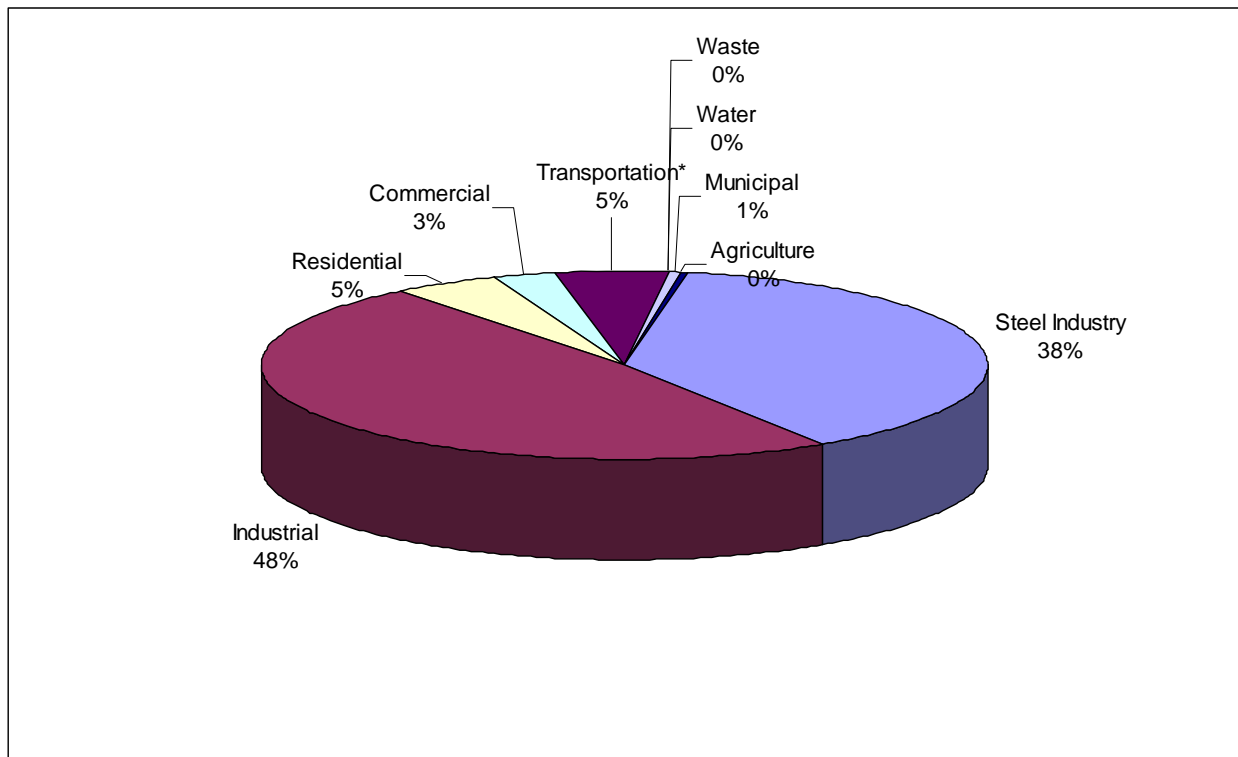
Community Emission Reductions (Mitigation):

In 2010, community emissions were estimated at 19,975,603 tonnes, a reduction of 14.5% from 2006 emissions levels (estimated at 23,351,712 tonnes)⁷. These changes occurred due to reduced energy demand, improved energy efficiency and conservation actions in the community, and the shifting of energy from coal as part of the Province's actions towards the phasing out of coal in Ontario's energy mixture sources by 2014. In Hamilton, natural gas and electricity consumption appear to have steadily declined 3% and 9% respectively while customer levels increased since 2006.

⁷ Evaluation of the community emissions inventory in 2011 discovered baseline emissions to be higher than previously reported due to a discrepancy in the reported energy data and calculations.

Figure 4 identifies the sources of local greenhouse gas emissions and includes both community and municipal emissions.

Figure 4: Total Greenhouse Gas Emissions Corporate and Community, 2010



Municipal operations represent only 1% of the total emissions in the community (**Figure 4**). However, municipal policies influence greenhouse gas emissions from waste, transportation, residential, commercial and industrial buildings. The Steel Sector (38% of **Figure 4**) is regulated by the Federal government to address greenhouse gas and energy emissions. **Figure 5** removes the Steel Sector to highlight the areas that Hamilton can influence through local and Provincial policies, programs and partnerships in the community including transportation (8% of **Figure 5**), industrial, commercial and residential energy usage (totalling 91% of **Figure 5**).

Figure 5: Total Greenhouse Gas Emissions - Corporate and Community (Minus Steel), 2010

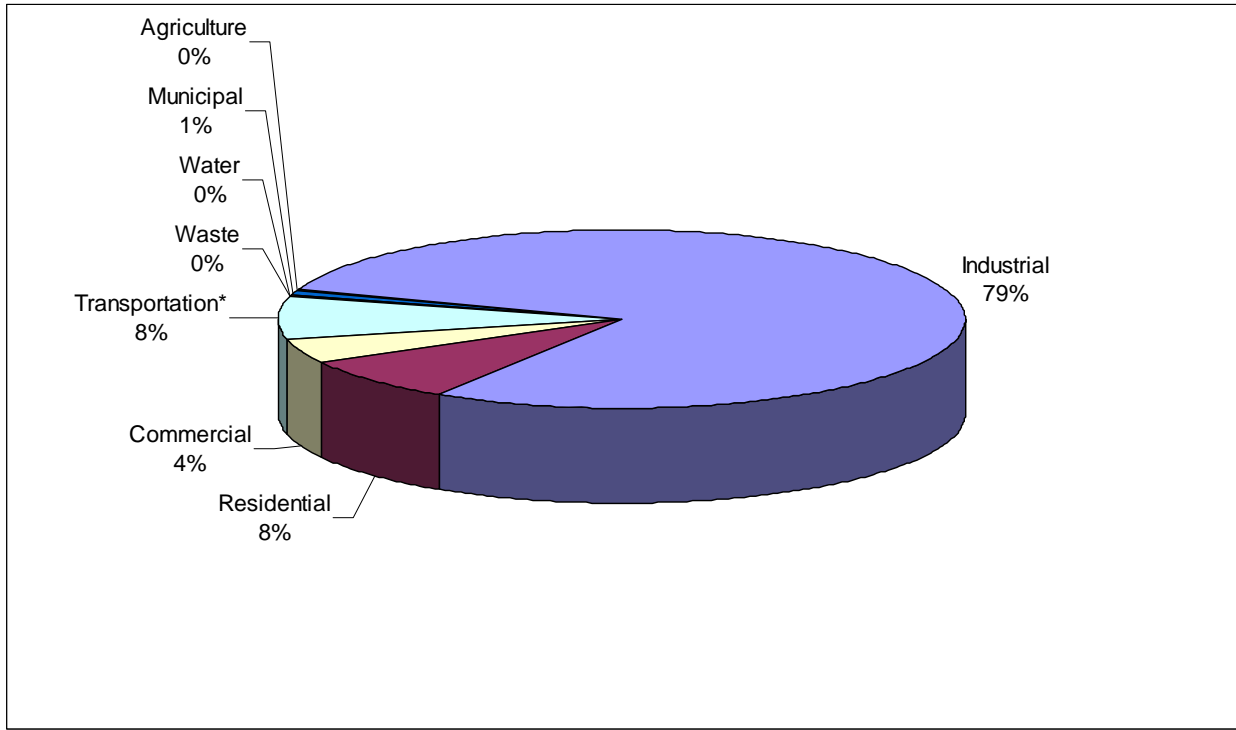
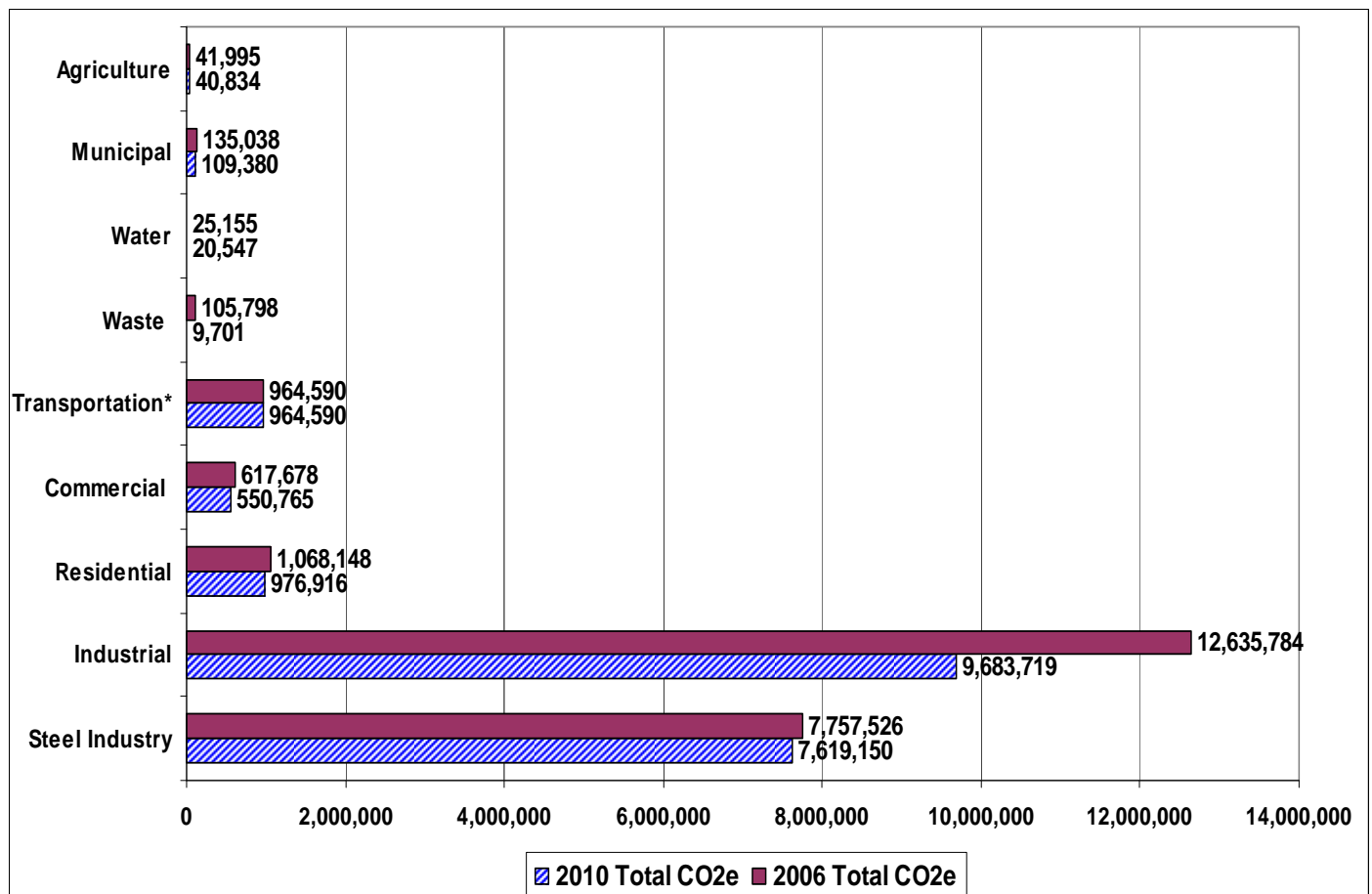


Figure 6: Changes in Community Emissions from 2006 to 2010



As seen in **Figure 6**, greenhouse gas emissions have dropped since 2006 in the residential (9%), commercial (11%), industrial (23%) and the steel industry (2%).

Significant emission reduction in community emissions was achieved in waste management through the capturing of landfill gases to convert to energy at the City owned and operated 3.2MW Glanbrook cogeneration landfill site facility.⁸ 2010 data shows a 92% reduction in emissions from 120,414 tonnes in 2005 to 9,071 tonnes in 2011 from capturing of methane emissions. The capturing of energy from methane was recognized by International Cities for Local Environmental Initiatives (ICLEI) as a top performer of Canadian municipal greenhouse gas mitigation actions in 2011.

⁸ Although the operation of the Glanbrook Landfill is owned and operated by the City and is considered a Corporate operation, International Greenhouse Gas Standard Protocols require that Municipal and privately owned and operated landfills be considered in the community inventory.

Transportation numbers have not been updated from the 2006 inventory and thus show no change⁹. Data on transportation comes from Statistics Canada and Transportation for Tomorrow Surveys which are undertaken every five years¹⁰. The City's Transportation Master Plan (PW07022) and related transportation programs are also dependent on these transportation statistical numbers for tracking purposes.

Energy demand, conservation and changes in energy sources in 2011 and 2012 suggest further expected emission reductions to the community and the City.

The 2013-2015 Corporate Strategic Plan has identified the undertaking of a Community Climate Change Action Plan. City staff are investigating resource needs and community engagement for the undertaking of a Community Climate Change Action Plan. City staff will return to Council in 2013 with options and recommendations.

Hamilton Community Climate Change Charter

In 2011, the City of Hamilton endorsed the Hamilton Community Climate Change Charter (PED 11150). This endorsement recognized Hamilton as the first municipality in Ontario with a community Climate Change Action Charter.

The Hamilton Climate Change Action Charter is a voluntary agreement that outlines the need for local action and a commitment to take action on climate change from individuals, organizations and businesses of all types and sizes in Hamilton. Endorsing and participating in the actions outlined in the Charter are voluntary.

The Charter is meant to increase citizens' awareness on climate change, seeks leadership and commitment to act from key organizations in the City, and provides a starting point for community action and measurements of progress on combating climate change in Hamilton.

Since 2011, 40 organizations and over 200 individuals in Hamilton have endorsed the Charter. These 40 organizations are:

- Ancaster-Dundas-Flamborough-Westdale Green Party of Ontario Constituency Association
- Ancaster-Dundas-Flamborough-Westdale Green Party of Canada Electoral District Association
- Beasley Neighbourhood Association
- Blue Green Canada
- The City of Hamilton

⁹ At the time of the writing of this report, transportation numbers have not been released from the 2011 Census by Statistics Canada.

¹⁰ At the time of the writing of this report, notifications that the Transportation for Tomorrow Surveys would begin in Hamilton in 2012 were received.

- Clean Air Hamilton
- Congress of Union Retirees of Canada
- Corr Research
- Council of Canadians - Hamilton Chapter
- Creating Healthy and Sustainable Environments(CHASE)
- Dundas in Transition
- Eco Churches of West Hamilton
- Environment Hamilton
- First Unitarian Church of Hamilton
- Giant's Rib Discovery Centre
- Green Part of Canada, Hamilton Centre EDA
- Green Party of Hamilton - Hamilton Centre CA
- Green Venture
- Greening Marketing Inc.
- Hamilton 350
- Hamilton Area Steelworkers
- Hamilton/Burlington KAIROS Committee
- Hamilton CarShare
- Hamilton Conservation Authority
- Hamilton District Labour Council
- Hamilton-Wentworth District School Board
- Lura Consulting
- MACgreen
- Manorun Organic Farm
- McKibbon Wakefield Inc
- McMaster Centre for Climate Change Research
- McMaster University
- Mohawk College
- North End Neighbours
- Refficient
- Royal Botanical Gardens
- St. James's Anglican Church
- Sustainable Hamilton
- The Hammer Active Alternative Transportation
- Union Gas

Since 2009, the City of Hamilton and community have held an annual Climate Change Action Month in October to encourage individuals and organizations to take action on climate change locally. Several organizations in the community hold events and workshops during this month to educate and highlight the activities in the community that are addressing climate change and to inform others of the need for action. October 2012 is Hamilton's 4th Climate Change Action month and the first year that signatories will report on their actions under the Charter.

Climate Change Adaptation

Adaptation is planning or introducing measures to reduce the vulnerability of natural and human systems against actual or expected climate change effects. Adaptation includes technical adaptation (e.g. new technology or resources that reduce dependency on non-renewable natural resources and energy constraints); environmental adaptation (e.g. responding to the changes in natural systems such as water, air, and forests); and social adaptation (e.g. changes in personal behaviour and social/community support services).

According to the Intergovernmental Panel on Climate Change (IPCC), climate change is underway and the impacts of climate change will be severe. Even if world wide greenhouse gas emissions were radically reduced immediately, global temperatures will continue to increase.

In Hamilton, potential impacts include extreme weather events, flooding, droughts, and increased temperatures leading to increased health risks and financial costs. The potential impacts of climate change and increasing greenhouse gases include:

- Vulnerability of infrastructure (water, roads, energy) to several types of extreme weather events, including droughts, intense precipitation, extreme temperature episodes, high winds, and severe storms for which they are currently unprepared;
- Insurance and reinsurance industries that may already be burdened and may increase liability costs or remove coverage as the risk associated with investment in property, infrastructure and resource-base industries increases;
- Decreasing and variable average water levels in the Great Lakes resulting in impacts on water supply and quality (groundwater and surface water);
- Changes in the frequency of severe storms and associated safety risks;
- Changes in precipitation and temperature that will affect water levels in waterways and wetlands, thereby affecting their ability in flood protection, water cleansing, and waterfowl/wildlife habit and their use in recreational pursuits (fishing, camping, and boating);
- Increased temperatures, especially extreme heat, which contributes to greater heat stress in the elderly and ill;

- Increased demand for building cooling resulting in increased use of air conditioning and higher energy consumption, greenhouse gas emissions and air pollution, and potential energy fluctuations;
- Preferred conditions for pests (insects, rodents, disease vectors) and increases in weeds and pollen, resulting in an increased allergy attacks in individuals;
- Changes in temperatures resulting in increased maintenance costs for transportation infrastructure, with variable freeze-thaw cycles, increased pavement buckling due to longer periods of intense heat and shifts from less snow to more freezing rain; and,
- Changes in agriculture (extreme droughts, floods, shifting produce, weeds and insects) affecting the supply of foods.

A few global cities have begun to undertake risk management towards climate change impacts such as extreme weather events. Very few have moved towards implementation of these risk management plans.

Key sectors for an urban risk management approach to climate change include:

- *Infrastructure and Settlements* (e.g. drainage, storm surge barriers, wetland protection);
- *Water Management* (e.g. storage and conservation because of expected shortage of clean water);
- *Transport* (e.g. improved design and safety standards); and,
- *Energy* (e.g. infrastructure strengthening, source diversification).

In 2004, the City of Hamilton completed a Climate Change Vulnerability Background Study for the GRIDS growth strategy. The results of this study encouraged the City to develop a Climate Change Action Plan and recognized that an in-depth consideration of the related impacts and response to climate change risks and scenarios had not been developed in detail.

A specific gap identified under the Corporate Air Quality and Climate Change Strategic Plan (PED06336(a)) was undertaking adaptive planning to reduce the risks of climate change in policies and actions. An initial step for developing a climate change impact and disaster management risk plan is building a solid information base.

Corporate actions need to include an element of preparation and risk protection from climate change that the Corporation cannot directly control but can still prepare for. A number of local and regional governments have begun to address these risks through undertaking vulnerability scans and adaptive planning to prepare for climate change impacts.

Examples of indicators or measures for informing adaptation actions and climate impacts tracking by other governments include:

- Number of extreme precipitation events
- Average seasonal precipitation
- Average seasonal temperatures (day and night)
- Number of swim advisory or swim ban days
- Number of sewer overflows
- Number of basement flooding events
- Number of public cooling centres
- Number of incidents of pavement buckling
- Total tree canopy

The City's Public Works Department has begun to address the impacts of climate change and extreme precipitation, such as significant rainfall events with intensities, durations and frequency of re-occurrence, through the Storm Event Response Group and the Flood Aware Program. Stormwater Infrastructure Service Planning has integrated mitigation to climate change in the form of Low Impact Development (LID) via Secondary Planning Policies.

Hamilton Public Health Services has started to examine and modify response strategies to reduce the risk of increased temperatures and heat on the most vulnerable neighbourhoods in Hamilton through a Heat Vulnerability Index. The Heat Vulnerability Index maps out the risk-variables associated with heat-related illness and helps better plan heat notification and response activities.

However, climate change poses impacts across City Departments and services to the community. Responses to the risks associated with climate change requires a strategic and risk management focus through a policy, planning, health, engineering, financial, and emergency response lens.

In November 2012, the City of Hamilton is hosting the ICLEI Canada Liveable Cities Forum: Creating Adaptive and Resilient Cities. The Forum will focus on climate change adaptation and the role of local government. The two-day event will bring together municipal practitioners, researchers, policy makers and elected officials from across Canada to collaborate and share insights and best practices related to local climate change adaptation practices.