A QUESTION OF COMMITMENT

Review of the Ontario Government's Climate Change Action Plan Results

Annual Greenhouse Gas Progress Report 2012
Environmental Commissioner of Ontario

December 2012

Environmental Commissioner of Ontario

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Commissaire a l'environnement de l"Ontario

Gord Miller, B.Sc., M.Sc.
Commissioner

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Commissaire

December 2012

The Honourable Dave Levac
Speaker of the Legislative Assembly of Ontario
Room 180, Legislative Building
Legislative Assembly
Province of Ontario
Queen's Park

Dear Speaker:

In accordance with Section 58.2 of the *Environmental Bill of Rights, 1993*, I am pleased to present the Annual Greenhouse Gas Progress Report 2012 of the Environmental Commissioner of Ontario for your submission to the Legislative Assembly of Ontario. This Annual Report is my independent review of the Ontario government's progress in reducing greenhouse gas emissions for 2011–2012. It does not include a review of the government's Climate Change Progress Report 2012 as this document was released too late for inclusion.

Sincerely,

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Environmental Commissioner of Ontario

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Executive Summary

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Executive Summary

With the release of its Climate Change Action Plan in August 2007, the Government of Ontario made a commitment to play a leadership role in the province's transition toward a low-carbon future. To do this, it established a policy framework comprising a range of measures to reduce Ontario's carbon footprint across the major greenhouse gas emitting sectors: electricity, transportation, industry, buildings, agriculture and waste. A Climate Change Secretariat was established in Cabinet Office to co-ordinate government-wide actions and to work horizontally across ministries to ensure that policies and programs were effective. The Plan established province-wide targets and timelines to track progress. It also included a commitment to be accountable to the Ontario Legislature and the people of Ontario by reporting annually on progress in achieving the emissions reduction goals set out in the Plan.

To date, progress has been made in some areas. For example, in the **electricity sector**, the ongoing phase-out of coal has driven emissions down significantly and sets the stage for reductions in other sectors if co-ordinated action is taken. Unfortunately, the government has not implemented measures that will effectively confront the largest remaining emissions sources.

By the government's own admission, the current policy framework will only get Ontario just over half way toward the government's 2020 target, leaving a projected 'ambition gap' of 30 megatonnes that will not be closed without new policy.

In the **transportation sector**, emissions resumed their upward trajectory in 2010 after a slight decline during the recession of 2008–2009. Meanwhile, policies and programs that would stimulate emissions reductions in that sector either ended early or were scaled back (e.g., electric vehicle programs, the installation of high occupancy vehicle lanes, the Green Commercial Vehicle Program, etc.).

In the **industrial sector**, development of the province's planned cap-and-trade program remains stalled, and there are few complementary policies in place to stimulate additional emissions reductions.

The **building sector** will likely see modest reductions as the new version of the Ontario Building Code comes into effect over the next five years. However, emissions due to natural gas consumption remain a significant barrier to future progress.

In the **agricultural sector**, there is little evidence that the current voluntary approach, as exhibited through the Environmental Farm Plan program, is having any demonstrable effect on emissions, particularly with respect to synthetic fertilizer use – the largest source of emissions in that sector.

Finally in the **waste sector**, the use of landfill gas capture systems is likely resulting in higher methane releases than are accounted for in the provincial greenhouse gas inventory.

In conclusion, by the government's own admission, the current policy framework will only get Ontario just over half way toward the government's 2020 target, leaving a projected 'ambition gap' of 30 megatonnes that will not be closed without new policy action in the eight short years that remain.

SUMMARY OF ECO RECOMMENDATIONS:

The ECO recommends that the Ministry of Energy establish electricity sector greenhouse gas intensity targets that are aligned with the interim and final conservation target dates identified in the Long-Term Energy Plan.

The ECO recommends that the Ministry of the Environment make all data submitted pursuant to the greenhouse gas reporting regulation publicly available on an annual basis.

The ECO recommends that the Ministry of the Environment develop a strategy to better control greenhouse gas emissions from substitutes for ozone-depleting substances in all applications throughout their life cycles.

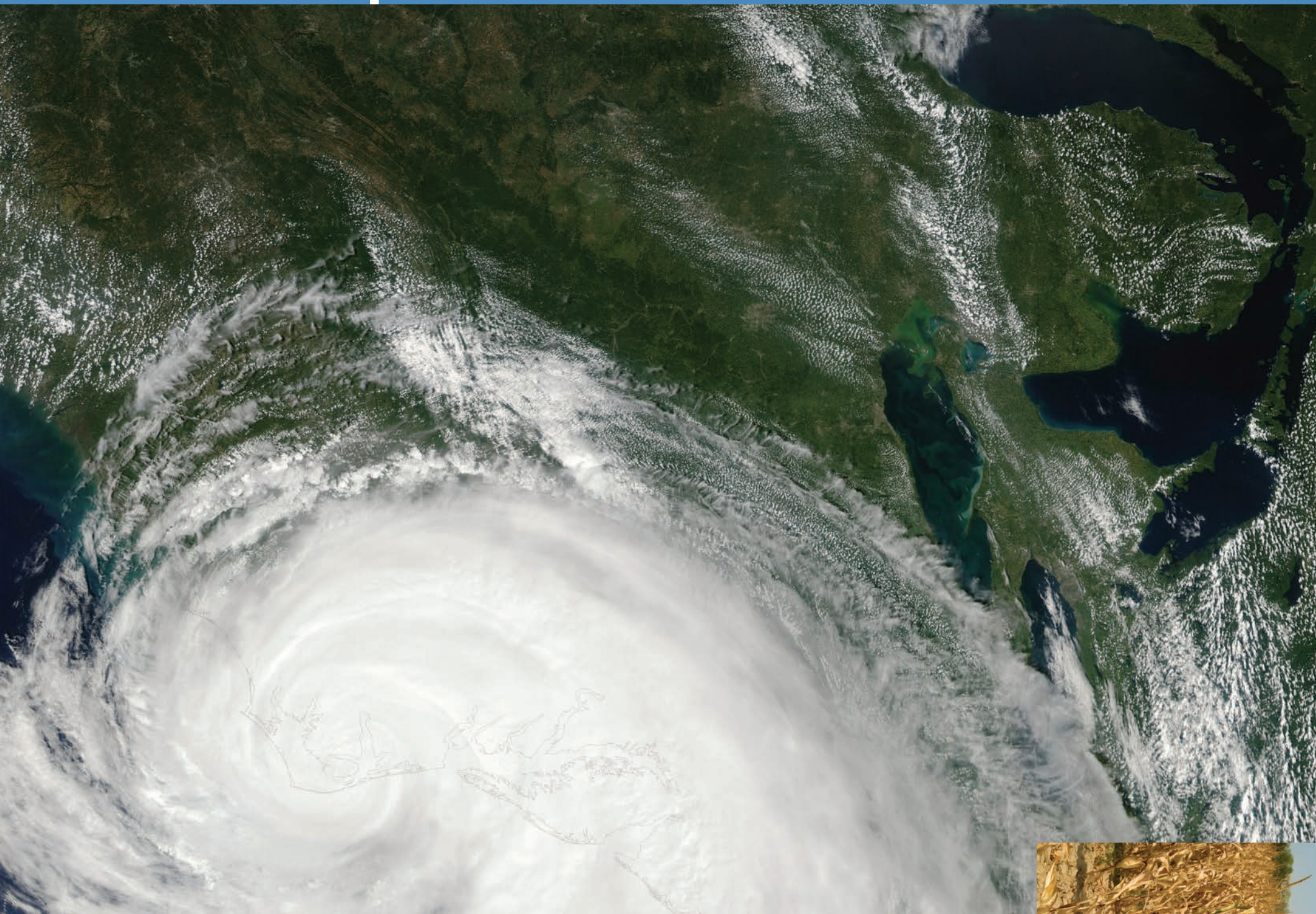
The ECO recommends that the Ministry of the Environment implement a phased-in ban on the landfilling of all organic residuals.

The ECO recommends that the government conduct an analysis of the environmental, social and economic impacts of alternative carbon pricing mechanisms and release it to the public for discussion.

A NOTE TO THE READER:

The ECO invited several Ontario ministries to review a draft of this report and to provide written responses to the five recommendations contained herein. The ministry responses are included in the main body of this report following each recommendation.

Introduction



It becomes clearer with each passing year that without a drastic change in the upward trajectory of global greenhouse gas emissions, the planet is headed for a frightening future.

Introduction

Over the past year, global atmospheric carbon dioxide (CO_2) concentrations have continued their seemingly inexorable rise. Preindustrial levels of CO_2 in the atmosphere were about 280 parts per million (ppm). In August 2011, the concentration of CO_2 in the atmosphere was 390 ppm; one year later, it reached 392 ppm and continues to increase. While global average temperatures have increased by about 1°C since 1880, this small change is already dramatically affecting the climate. Scientists are becoming increasingly confident that extreme weather events – like the droughts, floods and record-breaking temperatures experienced this past summer – are becoming more frequent due to human-induced climate change. As a harbinger of more intense changes to come, retreating Arctic sea ice reached a new record low in 2012. The effects of shrinking ice will be felt the world over as open water absorbs more heat than reflective ice, thus exacerbating the warming trend. It becomes clearer with each passing year that without a drastic change in the upward trajectory of global greenhouse gas (GHG) emissions, the planet is headed for a frightening future.

British Columbia has re-affirmed its commitment to a carbon tax program that has earned international recognition as an effective model for climate action.

The risks in further delay were highlighted by the International Energy Agency (IEA) in its 2011 World Energy Outlook report.[1] Using three different emissions scenarios, the IEA examined the level of future emissions that were already "locked-in" by existing high-carbon infrastructure. Under the most ambitious policy scenario, where the atmospheric concentration of CO_2 peaks at 450 ppm prior to 2020, the IEA concluded that 80 per cent of total emissions are "locked-in" from infrastructure that is already in place or under construction. Without further action before 2017, these emissions will reach 100 per cent of the level consistent with a 450 ppm scenario, meaning that all energy-related infrastructure built after this point would have to be zero-carbon. While this conclusion imparts some urgency to the situation, it is compounded by the fact that the 450 ppm scenario is consistent with only a 50 per cent chance of limiting global average temperatures by 2°C above pre-industrial levels.

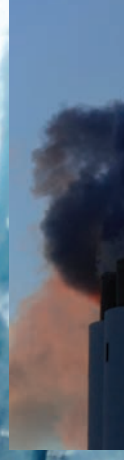
Some jurisdictions are responding to this existential threat by pricing carbon pollution. Australia has implemented a carbon pricing program that charges companies the equivalent of $24 for every tonne of CO_2 they emit and intends to link this program with the European Union Emissions Trading System. Japan implemented a carbon tax in April 2012, and China has created seven different pilot carbon pricing programs with a view to rolling out the best

model nationally by 2015. In North America, several provincial and state governments are taking steps to enact domestic carbon pricing policies. California and Quebec have put a legislated cap on carbon emissions and will require large emitters to comply through the purchase and trade of carbon allowances starting in 2013.

British Columbia has re-affirmed its commitment to a carbon tax program that has earned international recognition as an effective model for climate action. As evidence that smart climate action does not hurt economic performance, in the four years since B.C.'s carbon tax took effect (2008–2011), the province's economic growth (as measured in gross domestic product) has outpaced the rest of Canada, and personal and corporate income tax rates have been reduced to among the lowest in the country. At the same time, per capita fossil fuel consumption in B.C. has dropped substantially – declining 16.4 per cent more than the rest of Canada – and hybrid vehicle adoption has been twice the national average.

While it may be premature to make a direct correlation between the carbon price and these trends, they are nonetheless consistent with experiences in other jurisdictions that have had a carbon price in place for over a decade (e.g., United Kingdom, Germany and Sweden). These benefits have also been recognized by the Canadian Council of Chief Executives, which has argued that a "price signal is the most powerful incentive for both industry and consumers to conserve energy and enhance efficiency. Coupled with the appropriate overall policy framework, carbon pricing can lead to innovation and new technologies that have positive outcomes for consumers and position Canadian firms to be suppliers of less carbon-intensive products and services."[2]

Smart jurisdictions are also leveraging their strengths to implement measures that target the major sources of emissions. A good example of this practice comes from Norway where, like Ontario, the electricity sector is largely carbon-free and transportation is one of the largest sources of emissions. In an attempt to leverage its low-carbon power grid to reduce transportation emissions, the Norwegian government has moved aggressively forward with economic policies that support the purchase of electric vehicles (e.g., exemption from sales tax and road tolls, free public parking, etc.). Norway, a country with less than half the population of Ontario, now has more than 3,000 charging points and the highest number of electric vehicles per capita, despite being a major oil and gas exporter.



An Overall Assessment

1

Inconsistent reporting dates, and the failure to provide sufficient time to review and respond to published reports, represents a significant and ongoing challenge to the ECO in fulfilling our legislative mandate.

Section 58.2 (1) of the *Environmental Bill of Rights, 1993* requires the Environmental Commissioner of Ontario (ECO) to report annually to the Ontario Legislature on the progress of activities in Ontario to reduce GHG emissions. The ECO is also required to review any annual report on GHG reductions or climate change published by the government during the year. A report published by the government on GHG reductions released in April 2011 was reviewed in our 2011 Annual Greenhouse Gas Progress Report. The government's most recent annual report was released to the public in mid-November 2012, too late to be reviewed in this report. Inconsistent reporting dates, and the failure to provide sufficient time to review and respond to published reports, represent a significant and ongoing challenge to the ECO in fulfilling our legislative mandate.

This report reviews the most recent overall emissions data from available sources and places these within the context of the government's GHG reduction targets. The report then reviews sector-specific emissions data, as well as changes that were made to the emissions reduction policy framework within each sector during 2011–2012.

The long-term concentration of CO_2 in the atmosphere must be reduced to no more than 350 ppm if global climate conditions, similar to those in which our ecosystems and our civilization have evolved, are to be maintained.

Targets

In 2007, the government released Go Green: Ontario's Action Plan on Climate Change ("Climate Change Action Plan"), which established three GHG emissions reduction targets:[3]

- 6 per cent below 1990 levels by 2014 (to approximately 165 megatonnes or Mt);
- 15 per cent below 1990 levels by 2020 (to approximately 150 Mt); and
- 80 per cent below 1990 levels by 2050 (to approximately 35 Mt).

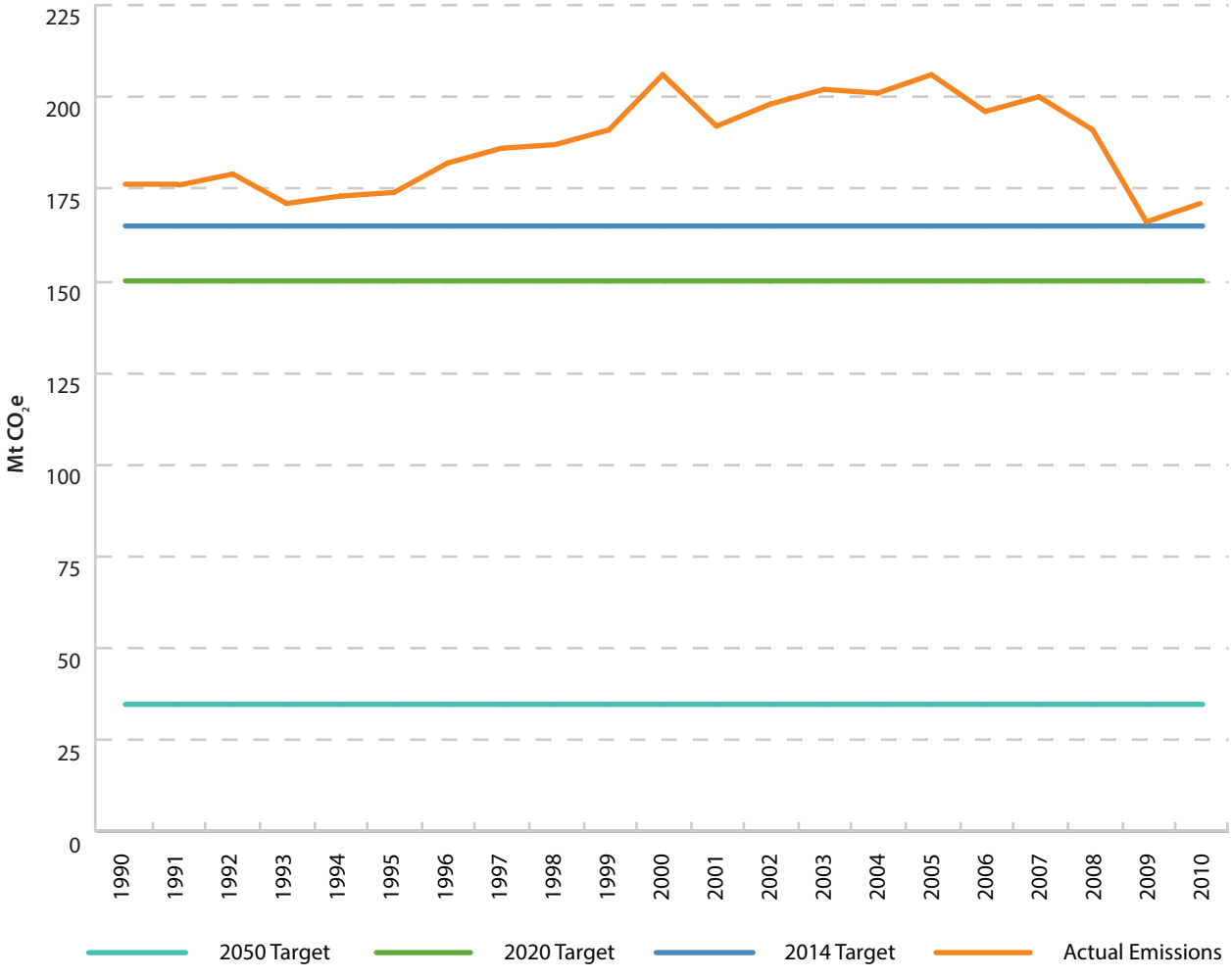
These targets are based on the internationally agreed-upon goal of limiting the increase in global average temperatures to 2°C above pre-industrial levels. In order to have a reasonable chance of preventing temperatures from exceeding this amount, the Intergovernmental Panel on Climate Change recommended in 2007 that the concentration of GHGs in the atmosphere would have to be stabilized at, or below, 450 ppm. More recent analysis of paleoclimatic data has led James Hansen, head of the NASA Goddard Institute for Space Studies, to conclude that the long-term concentration of CO_2 in the atmosphere

must be reduced to no more than 350 ppm if global climate conditions, similar to those in which our ecosystems and our civilization have evolved, are to be maintained. Unfortunately, the Ontario action plan and targets have not been adjusted to reflect this new understanding of the climate system.

Progress Toward the Targets

In 2010, Ontario's emissions of 171 Mt were 3 per cent below the 1990 base year level (176 Mt). Figure 1 tracks Ontario's emissions over the past 20 years against the targets in the Climate Change Action Plan.

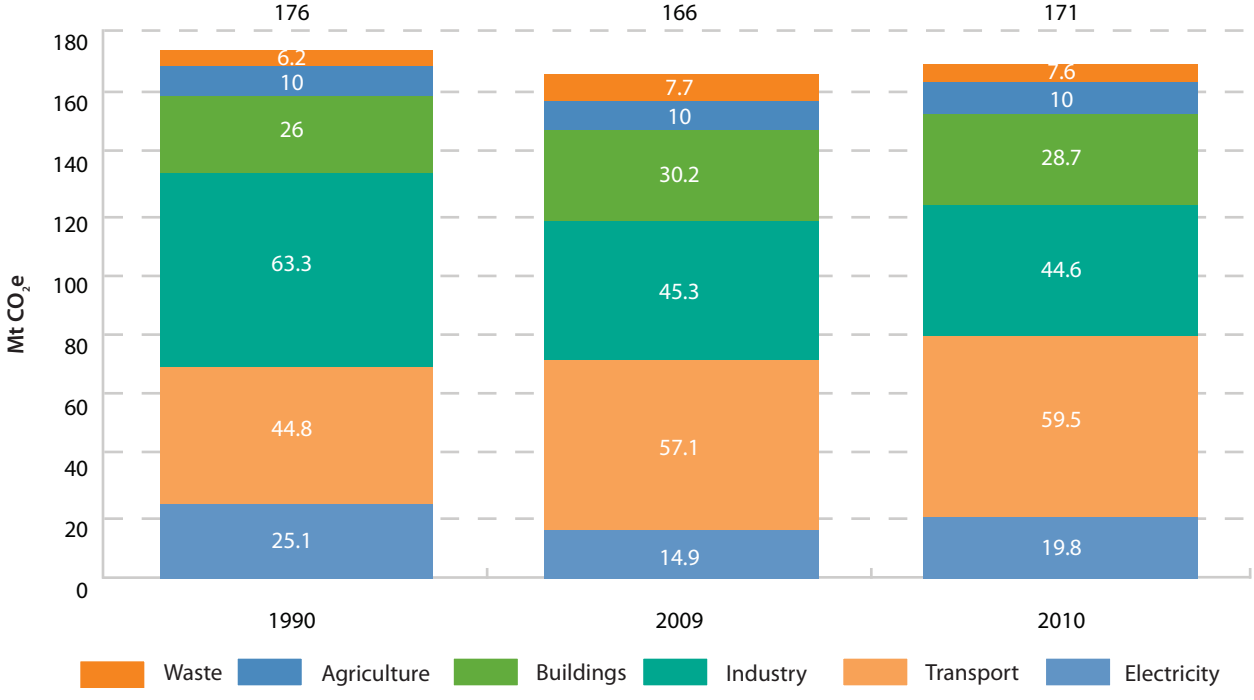
Figure 1: Actual Emissions versus Climate Change Action Plan Targets



Source: Environment Canada. (2012). *National Inventory Report – Greenhouse Gas Sources and Sinks in Canada 1990–2010*. Part 3, p. 61. Government of Ontario (2007). Go Green: Ontario's Action Plan on Climate Change.

While some sectors (such as electricity and industry) have experienced an overall decline since 1990, others (such as transportation) have witnessed an equally significant increase (Figure 2). In 2010, similar to previous years, the transportation sector was responsible for the largest volume of emissions, followed by industry and buildings.

Figure 2: Emissions by Sector, 1990, 2009 and 2010 in Megatonnes



Source: Environment Canada. (2012). *National Inventory Report – Greenhouse Gas Sources and Sinks in Canada 1990–2010*. Part 3, p. 61.

The Ontario government indicates that progress has been made toward meeting the 2014 and 2020 targets, primarily by phasing out the use of coal for electricity generation. The coal phase-out is a significant commitment that, on its own, takes Ontario most of the way toward meeting the 2014 target and at least halfway toward the 2020 target. Unfortunately, the ambition displayed in the electricity sector has not been matched in other areas over the past year, and the Ontario government will not reach its 2020 emissions target without additional policy action. The government, itself, has projected a 30 Mt gap by 2020, an amount that is almost equal to what will have been achieved through coal phase-out.

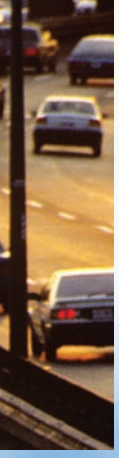
The ambition displayed in the electricity sector has not been matched in other areas over the past year, and the Ontario government will not reach its 2020 emissions target without additional policy action.

Research released by the National Round Table on the Environment and the Economy (NRT) in June 2012 assessed Canadian provincial climate change plans and examined the contribution each would make toward meeting Canada's 2020 GHG emissions reduction target. In conducting its modelling, the NRT included existing and proposed reduction policies at both the federal and provincial levels.[4] For Ontario, participation in the Western Climate Initiative's (WCI) cap-and-trade program was included and found to contribute a small, but important, amount of GHG reductions. Despite the cap-and-trade contribution, the NRT concluded that Ontario would not reach its 2020 target, but would instead fall short by about 14 Mt.[5] Given that it remains unclear when, or even whether, the government will move forward with putting a price on carbon through the WCI (or through any other mechanism, such as a carbon tax), the conclusion reached by the NRT would appear to understate the amount Ontario will fall short.

There remains a significant amount of untapped low- and medium-cost GHG emissions reduction potential in Ontario, particularly in the manufacturing and freight transportation subsectors.

The NRT modelling also identified sectors that could contribute additional emissions reductions in a cost-effective manner. The NRT found that there remains a significant amount of untapped low- and medium-cost GHG emissions reduction potential in Ontario, particularly in the manufacturing and freight transportation subsectors; both of these are areas that have yet to be targeted by concerted provincial government policy. Nonetheless, the NRT modelling found that in order to meet the provincial target of 150 Mt by 2020, emissions reductions across all sectors of the economy would be required.

While the NRT did not specify the particular policy tools that would drive emissions reductions, it was clearly of the opinion that firms and households will take actions that result in reduced emissions "only *in response to policy*" (emphasis in the original).[6] In other words, voluntary action will not be sufficient to drive emissions down to desired levels. Government policy and action is fundamental. The analysis conducted by the NRT supports the ECO's view that achievement of Ontario's 2020 target requires more policy options and tools be put on the table to stimulate cross-sectoral emissions reductions. There are now only eight short years left.



2 Progress in Individual Sector Areas

The continued presence of coal and natural gas in the generation mix provides opportunities for further emissions reductions.

Electricity

Introduction

Adjusting the makeup of the electricity supply mix can play a critical role in reducing carbon emissions in Ontario. While electricity generation accounted for only 12 per cent of Ontario's GHG emissions in 2010 (or just under 20 Mt), the continued presence of coal and natural gas in the generation mix provides opportunities for further emissions reductions.

Ontario's electricity sector emissions trends

Provisional data suggest that in 2011 electricity sector emissions declined by 7.6 Mt to 12.2 Mt (Figure 3a). The decline in carbon intensity (the amount of CO_2e produced per unit of energy generated) in this sector is driven by the ongoing phase-out of coal-fired generating capacity (Figure 3b). In addition, overall electricity generation peaked in 2008 and declined drastically the following year due to the recession (Figure 3c). Also of note is that natural gas appears to have surpassed coal as the largest source of GHG emissions in Ontario's electricity mix (Figure 4).

Figure 3: Historic Trends in Electricity Generation Emissions, Emissions Intensity and Generation, 2000–2011

Figure 3a: Electricity Sector Carbon Emissions, 2000–2011 (Mt CO_2e)

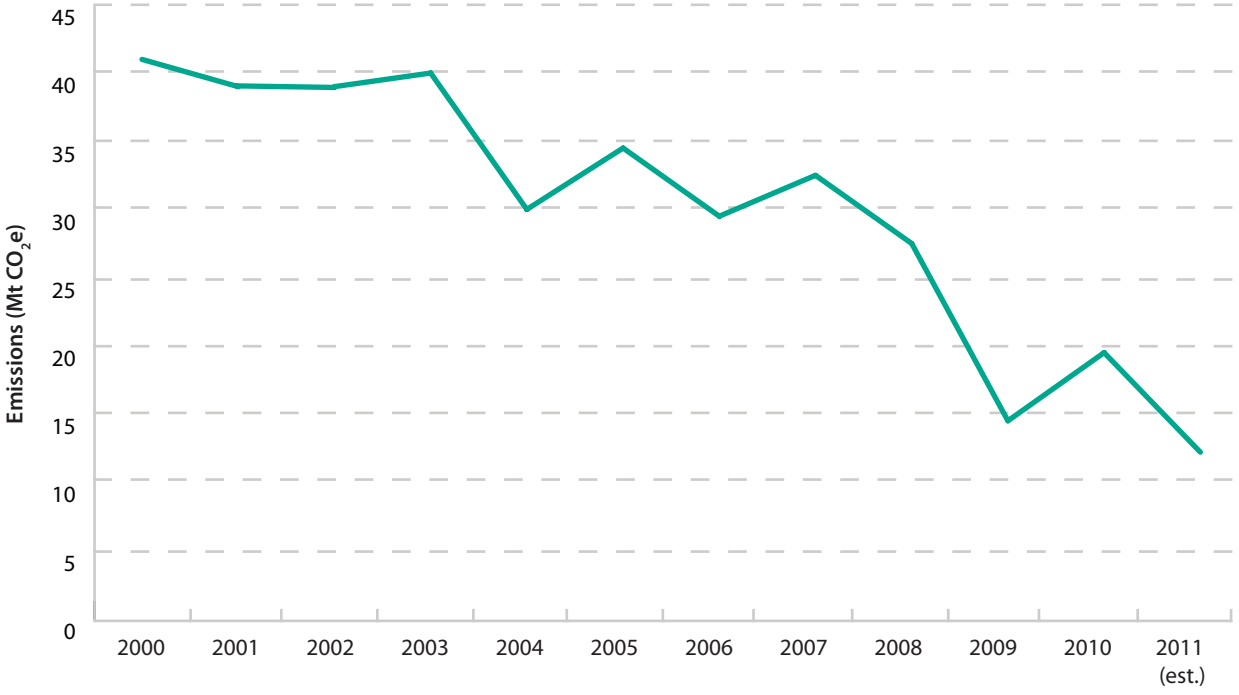


Figure 3b: Electricity Sector Carbon Intensity, 2000–2011 (g CO_2/kWh)

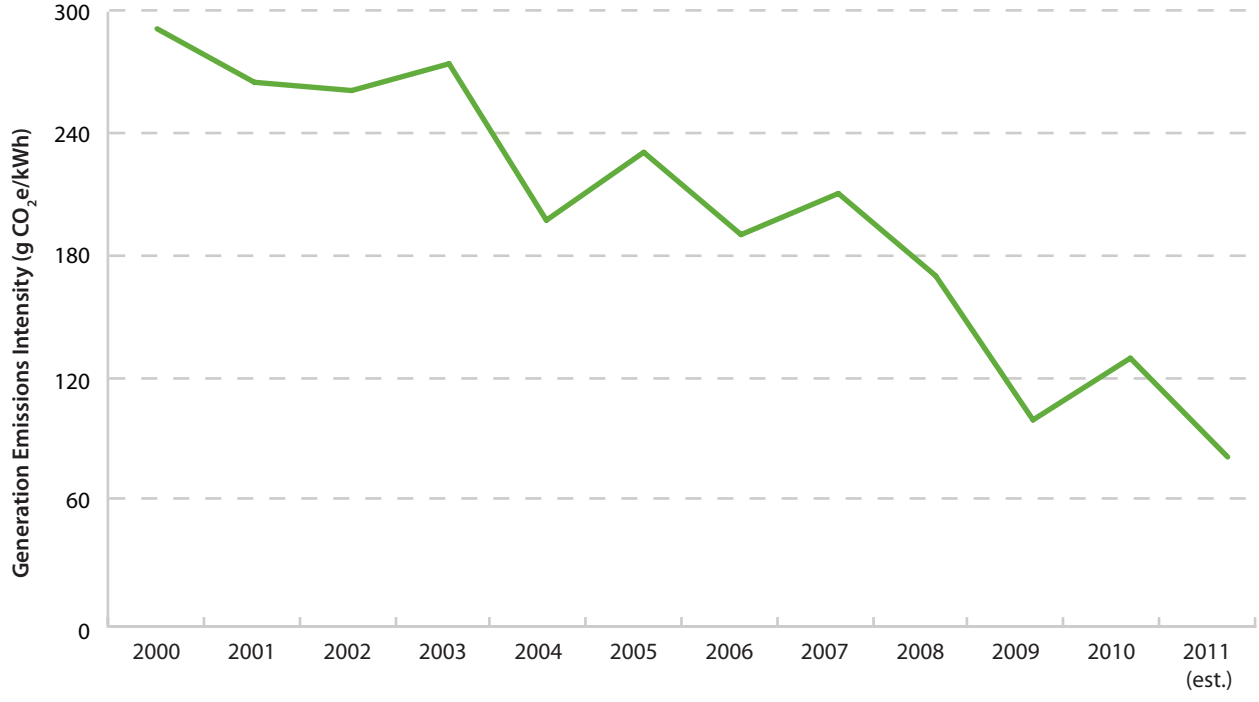
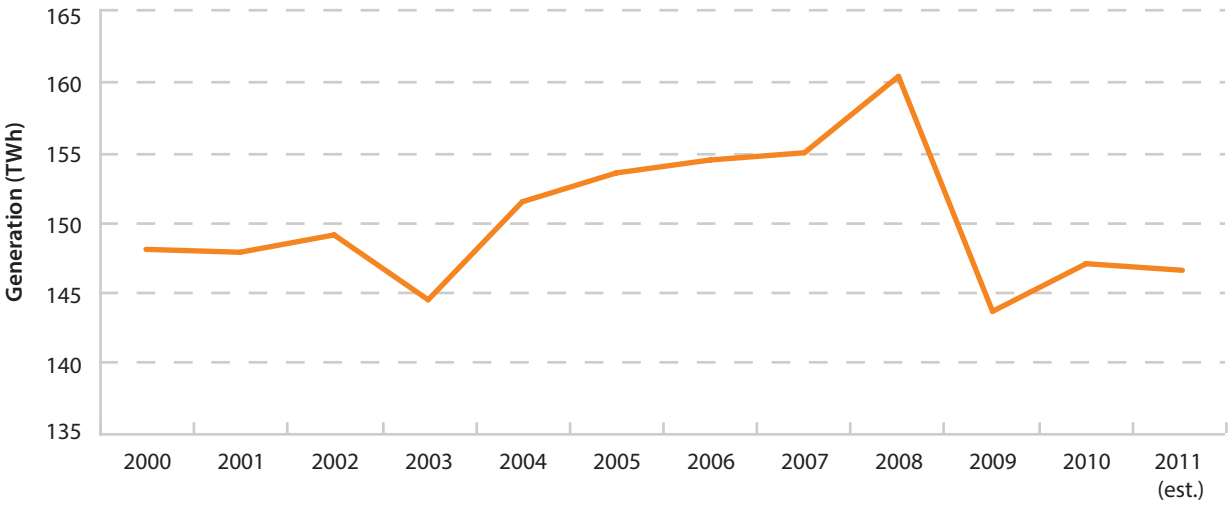
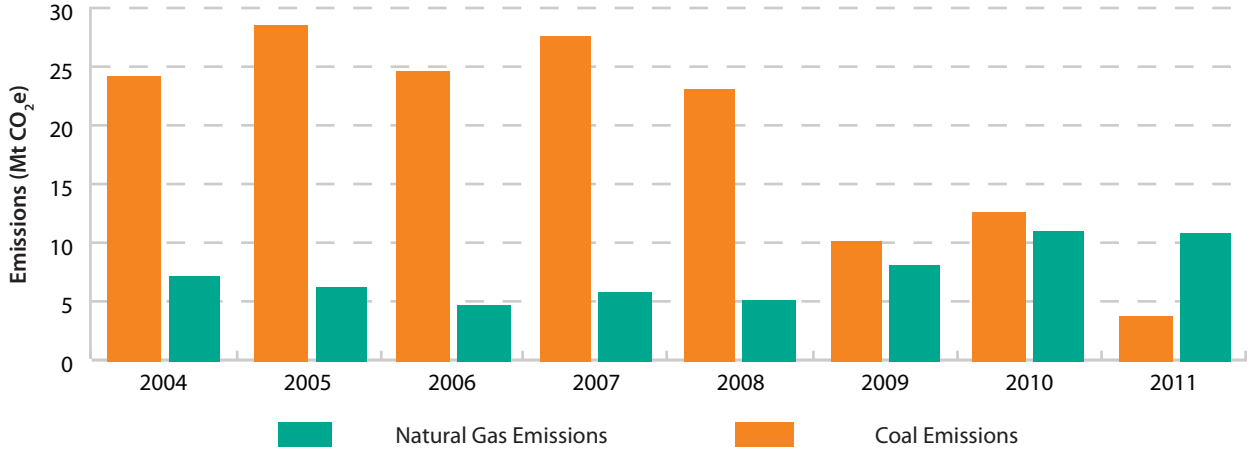


Figure 3c: Electricity Generation in Ontario, 2000–2011 (TWh)



Source: Environment Canada. (2012). *National Inventory Report – Greenhouse Gas Sources and Sinks in Canada 1990–2010*. Part 3, p. 61. Independent Electricity System Operator. *Supply Overview and Demand Overview*.

Figure 4: Electricity GHG Emissions by Source, 2004–2011



Source: 2005–2010 data: Environment Canada (2011). *Reported Facility Greenhouse Gas Data – Ontario – NAICS code 2211*. 2011 estimated data: Independent Electricity System Operator. *Supply Overview and Demand Overview*, using GHG intensity factor for coal (1,000 g/KWh) and natural gas (500 g/KWh) electricity generation. Chart includes electricity generation and GHG emissions from non-utility generators (NUGs) and, as such, records higher emissions than reported in the National Inventory Report that only records data from public utilities in the electricity generation sector.

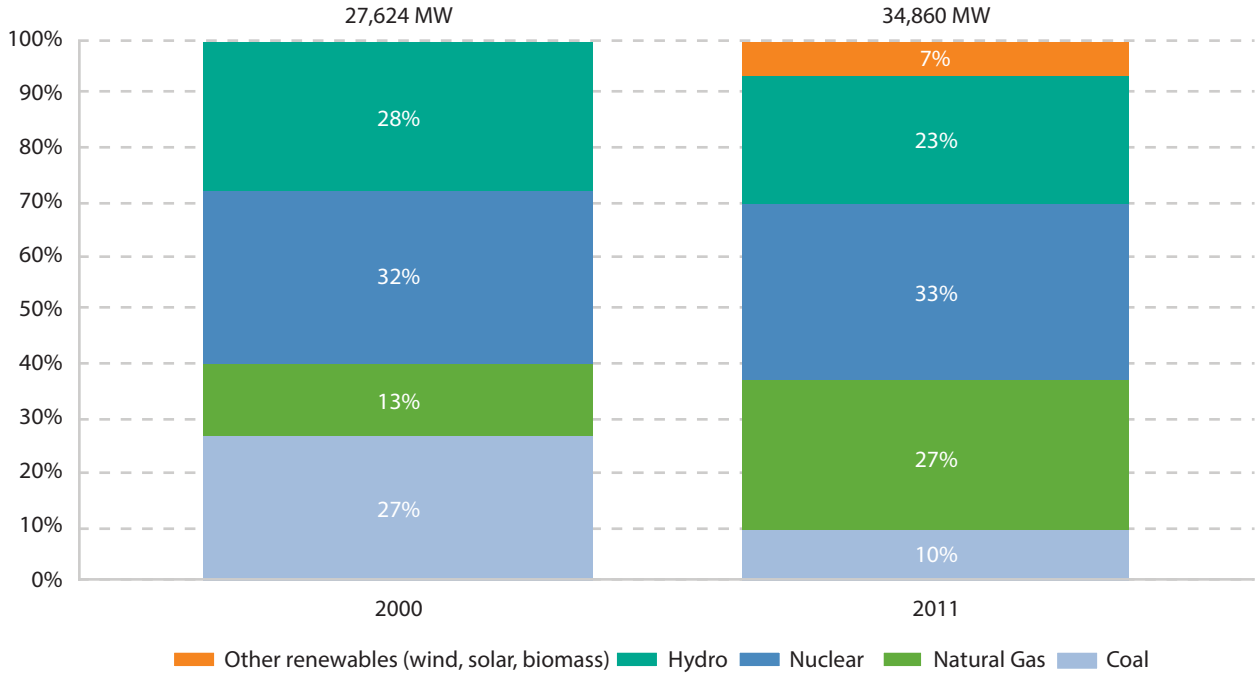
Wind, solar and biomass have grown to represent close to 7 per cent of total installed capacity in 2011.

Recent investments in renewable generation capacity have also contributed to the decline in carbon intensity. While hydro-electric generation capacity has historically been an important resource, wind, solar and biomass have grown to represent close to 7 per cent of total installed capacity in 2011 (see Figure 5). These sources generated approximately 3 per cent of overall supply in 2011, surpassing coal for the first time (see Figure 6).

The Long-Term Energy Plan

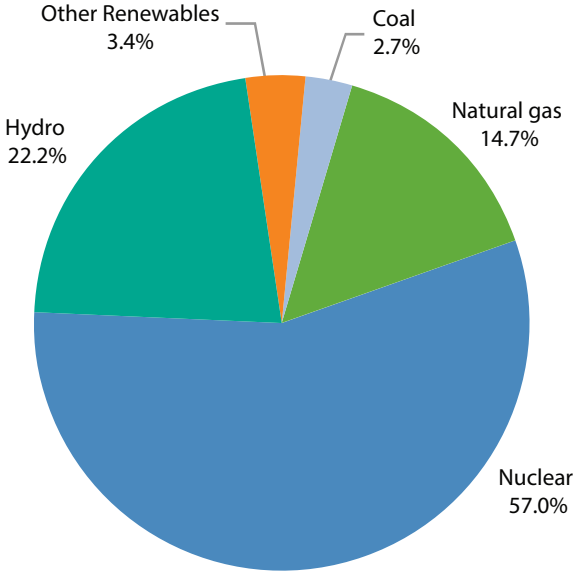
The Long-Term Energy Plan (LTEP) is the key reference point for electricity policy in the province. The Plan provides an assessment of electricity demand to 2030 and lays out a diverse mix of renewed, replaced or added supply over the next two decades to meet that demand. The Plan confirms the phase-out of coal-fired generation from the supply mix by the end of 2014 and projects that emissions in 2015 from electricity generation will be approximately 6 Mt. However, the Plan estimates that emissions from the electricity sector will increase thereafter; exceeding 10 Mt in 2019–2020 as natural gas is used to provide backup generation during the refurbishment of nearly 60 per cent of Ontario's nuclear capacity. The Plan is based on the assumption that the nuclear refurbishments are completed on schedule and projects that emissions will decline again to 5 Mt in 2030.

Figure 5: Installed Capacity by Fuel Type, 2000 and 2011



Source: Independent Electricity System Operator. *18-Month Outlook: An Assessment of the Adequacy and Capability of the Ontario Electricity System*. For non-hydro renewables: Ontario Power Authority (2011). *A Progress Report on Electricity Supply: Fourth Quarter 2011*.

Figure 6: Electricity Generation by Fuel Type, 2011[7]



Source: Ontario Energy Board. Ontario's System-Wide Electricity Mix: 2011 Data.

Further emissions reductions in the electricity sector will require the judicious use of natural gas, facilitated by an expansion of renewable generation capacity beyond today's levels.

The ECO is concerned about the apparent lack of alignment between the Climate Change Action Plan targets and the LTEP. There exist a number of opportunities to reduce the carbon intensity of Ontario's overall energy consumption and the total emissions of GHGs within the future restructuring of the electricity sector. Unfortunately at this time, neither the LTEP nor the institutions defining and guiding energy policy are sensitive to or charged with the responsibility of realizing these opportunities.

Ontario electricity sector – future trends

Figure 4 signals the challenge that the government faces in making continued progress toward the decarbonization of the provincial electricity supply. Natural gas capacity will remain part of the electricity mix for the foreseeable future, particularly as provincial nuclear facilities undergo refurbishment. However, natural gas is a questionable bridge to a low-carbon future, particularly when assessed on a life-cycle basis that includes fugitive methane emissions released during its production, distribution and use.

Further emissions reductions in the electricity sector will require the judicious use of natural gas, facilitated by an expansion of renewable generation capacity beyond today's levels. As well, there will need to be a reduction in overall consumption and peak demand.

The government has established two targets for expanded renewable electricity capacity. The first is for 9,000 megawatts (MW) of hydro-electric capacity by 2018. Currently Ontario has 7,947 MW in operation and more than 940 MW of capacity is either proposed or under construction (see Figure 7); this indicates a high likelihood of meeting the target.

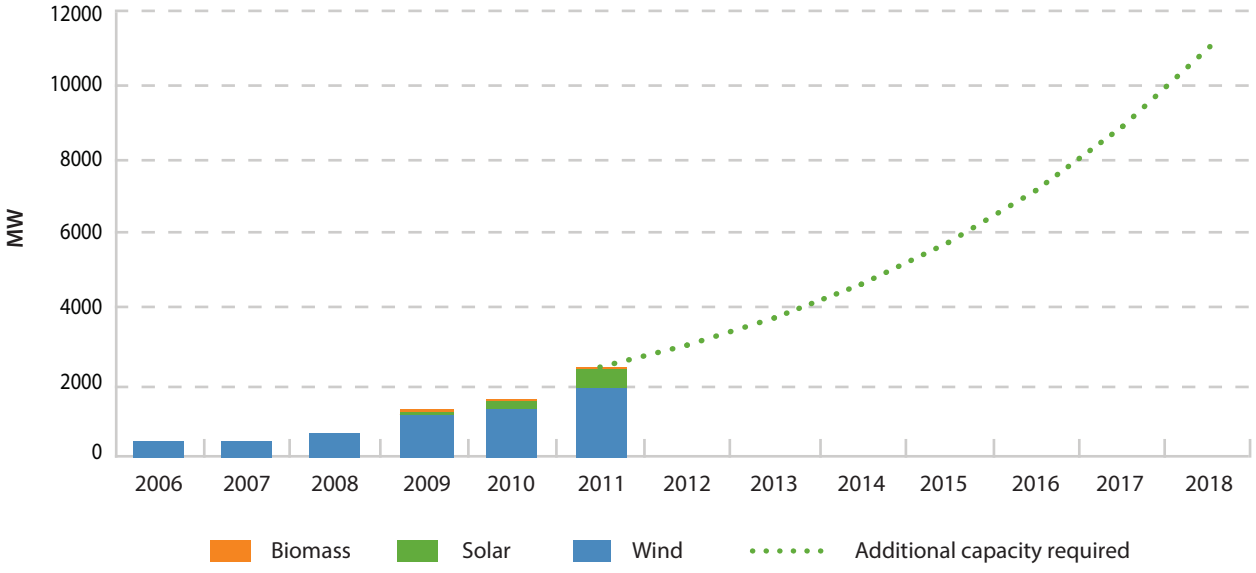
Figure 7: Hydro-electric Capacity Proposed and Under Construction in Ontario

Name	Projected capacity	Status
Lower Mattagami project	440 MW	Under construction – projected completion 2014
Niagara tunnel project	200 MW	Under construction – projected completion 2013
Little Jackfish project	78 MW	Proposed
Ranney Falls project	10 MW	Proposed
New Post Creek project	25 MW	Proposed
Feed-in Tariff projects	188 MW	Under development
Total	**941 MW**	

Source: Ontario Power Generation. *New Hydroelectric Power Projects. Ontario Ministry of Energy. Results-based Plan Briefing Book 2011–12*. p. 24.

The second renewable target is for 10,700 MW of non-hydro renewable capacity by 2018. Based on current levels of deployment, achievement of this target will require a sustained 24 per cent annual increase in non-hydro renewables (Figure 8).

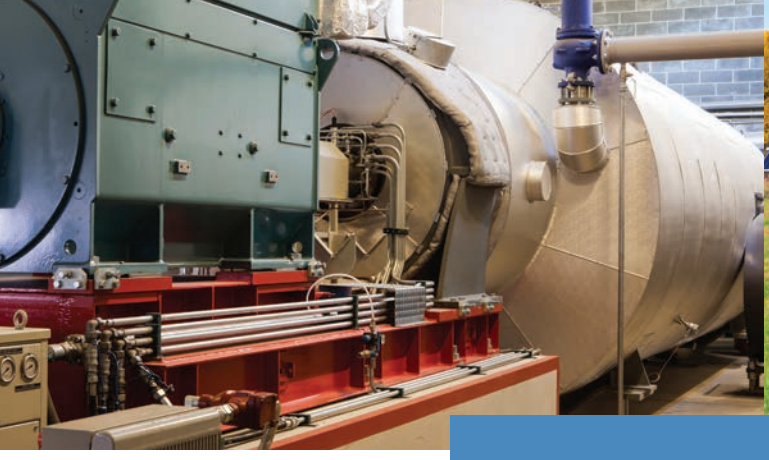
Figure 8: Cumulative Capacity of Non-Hydro Renewables to 2011 and Estimated Increase Required to 2018 to Meet Government Target



Source: Ontario Power Authority (2011). *A Progress Report on Electricity Supply: Fourth Quarter 2010*. Independent Electricity System Operator. *18-Month Outlook: An Assessment of the Adequacy and Capability of the Ontario Electricity System*. Note: historic deployment figures only include projects that have reached commercial operation at time of writing.

The key policy to sustain growth in renewables over the next several years is the OPA's Feed-in Tariff (FIT) program, which guarantees long-term pricing for the electricity generated by prescribed renewable projects. The FIT program has attracted more than 21,000 MW of applications, and 4,753 MW worth of contracts have been offered to date. However, only 453 MW have reached commercial operation under the program at time of writing due to difficulties in securing connections to the electricity grid. As well, the processing of FIT applications was suspended for a 10-month period as the program underwent a review. With the program re-launching, and work underway to resolve grid connection barriers, the ECO believes that the non-hydro renewable target for 2018 will likely be met.

The Ministry of Energy has indicated that, at the end of 2013, it will review the electricity supply and demand forecast to explore whether a higher renewable target is warranted. The ECO urges the ministry to consider the role that a higher level of renewables penetration can play in offsetting natural gas-fired (or fueled) generation and electricity sector GHG emissions. This is important in the near term as components of Ontario's nuclear facilities



Achieving higher levels of renewable electricity penetration will require increased flexibility in the system to manage the variability of resources.

come off line for refurbishment and even more so in the long term as the province strives to meet its 2050 objective. Achieving higher levels of renewable electricity penetration will require increased flexibility in the system to manage the variability of resources, like wind and solar, and the inflexibility of currently designed nuclear plants. This flexibility could be partly assisted by a smart electricity grid that actively manages supply and demand and reduces the need for natural gas-fired electricity to back up intermittent renewables (see Box 1).

The ECO is encouraged that efforts are being made on a number of fronts. The Independent Electricity System Operator (IESO) is working to integrate renewables into the grid. Among other changes, the IESO is introducing centralized weather forecasting to improve the accuracy of wind and solar generation predictions and is enhancing centralized control over wind generation facilities. These changes will assist in integrating growing, but variable, wind generation into a system dominated by largely inflexible nuclear generation. It is also clear that momentum is building for energy storage and other smart grid infrastructure. With respect to energy storage, utilities are experimenting with battery, flywheel and compressed air storage technologies, and there is a proposed 400 MW pumped hydro storage project in Central Ontario with a targeted operation date in 2015. What is lacking is an effort to unite

these various initiatives into a provincial strategy for energy storage. The ECO notes that a Clean Energy Task Force was established in April 2012 to explore, among other issues, the potential of energy storage.

BOX 1: THE SMART GRID AND DECARBONIZATION

The implementation of smart grid infrastructure provides several opportunities to reduce energy-related GHG emissions. Conservation and demand management, facilitated through the use of smart meters (and time-of-use rates), gives electricity consumers feedback about their consumption and allows them to reduce or shift electricity use to off-peak periods. Furthermore, the smart grid could facilitate the integration of electric vehicles: enabling them to be charged at night when rates are low; and using them as a storage source during the day when demand – and rates – are high. It could also help integrate renewable energy sources by engaging demand response and energy storage (including that from electric vehicles) to manage and absorb short-term fluctuations in demand and output. All of these mechanisms increase the flexibility of the electricity system and reduce the need for natural gas backup generation.

Smart grid infrastructure is recognized as a priority in the Long-Term Energy Plan, and the *Green Energy and Green Economy Act, 2009* specifically prescribed its development and implementation. The province has moved aggressively to deploy smart meters, an essential foundation for smart grid development, and has also allocated $50 million for the creation of a Smart Grid Fund to support demonstration projects.

While at this early stage it is difficult to assess the smart grid's contribution to GHG reductions in the electricity sector, the ECO expects that the government will begin measuring these benefits in the near future. Key indicators of success could include the penetration of energy storage and electric vehicle infrastructure, as well as improved energy management at the residential, industrial and commercial levels.

Uncertainty surrounding the province's renewable electricity intentions once the 2018 target has been met may put at risk continued decarbonization of the electricity supply.

The ECO supports the progress being made toward a decarbonized electricity system. Nonetheless, the province must not take future progress for granted. The ECO is concerned by the ongoing build out of natural gas generating capacity that, unless steps are taken on both the demand and supply sides, will create challenges for staying on a pathway that leads toward the 2020 and 2050 GHG targets. In addition, uncertainty surrounding the province's renewable electricity intentions once the 2018 target has been met may put at risk continued decarbonization of the electricity supply. The ECO is also concerned about this current situation given the need for sustained reductions in electricity sector emissions to meet the 2050 target, and recommends that the government set a GHG emissions intensity target for the sector based on a more aggressive deployment of renewable resources than planned for within the Long-Term Energy Plan. A GHG intensity target, in contrast to an absolute target, would accommodate increased electricity demand as a result of fuel switching in transportation and other efficiencies in buildings and industry.

BOX 2: UNDERSTANDING GREENHOUSE GAS INTENSITY

In the electricity sector, emissions intensity is expressed as a ratio of GHG emissions per unit of electricity generated. In Ontario, the GHG intensity of electricity generation has declined from 290 grams CO_2e/kWh in 2000 to 130 grams of CO_2e/kWh in 2010, primarily due to the coal phase-out. Greater use of renewable energy to meet future demand increases will continue to decrease emissions intensity. Meeting growth in demand by using natural gas-fired generation will increase the emissions intensity.

RECOMMENDATION:

The ECO recommends that the Ministry of Energy establish electricity sector greenhouse gas intensity targets that are aligned with the interim and final conservation target dates identified in the Long-Term Energy Plan.

MINISTRY RESPONSE:

Developing clean and renewable sources of energy and fostering conservation and energy efficiency are cornerstones of the government's vision for Ontario's energy future. Our electricity sector focus is on making absolute emissions reductions.

Ontario has witnessed a rise in both the volume of motor gasoline sales and transportation-related GHG emissions since 1990.

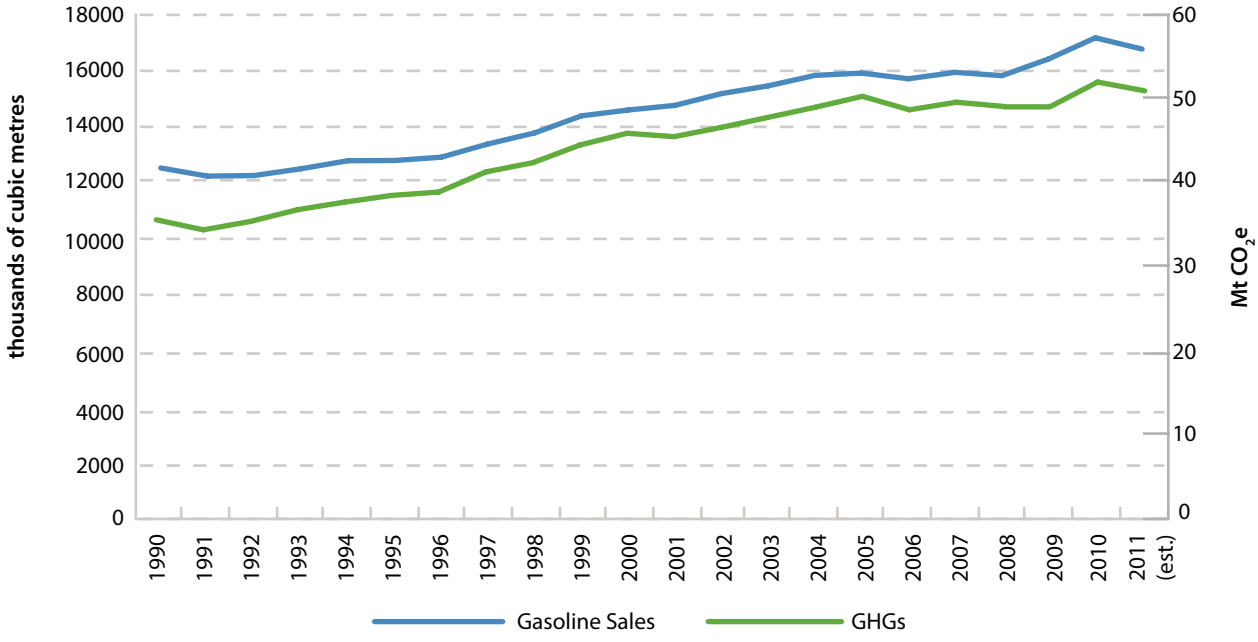
Transportation

According to the IEA, global transportation emissions could potentially be reduced by 30 per cent from current levels by 2050 through a combination of technological improvements, such as improved fuel efficiency, the increased market penetration of electric vehicles and the development of low-carbon alternative fuels.[8] Non-technological measures – such as improved land use planning, increased use of public transit and aggressive transportation demand management measures – can help drive further reductions by lowering vehicle use. Assuming a similar level of reductions can be achieved within Ontario, this section questions whether the province is on track to achieve this potential.

Ontario's transportation emissions

As shown in Figure 9, Ontario has witnessed a rise in both the volume of motor gasoline sales and transportation-related GHG emissions since 1990. Despite a slight drop during the recession of 2008–2009, emissions from this sector rebounded and were 59.5 Mt, or 34.8 per cent of overall emissions, in 2010. This amount was 33 per cent above the 1990 baseline of 44.8 Mt. Not only does this represent the largest increase of all sectors, transportation now represents the greatest share of provincial emissions.

Figure 9: Motor Gasoline Sales and Transportation GHG Emissions, 1990–2010

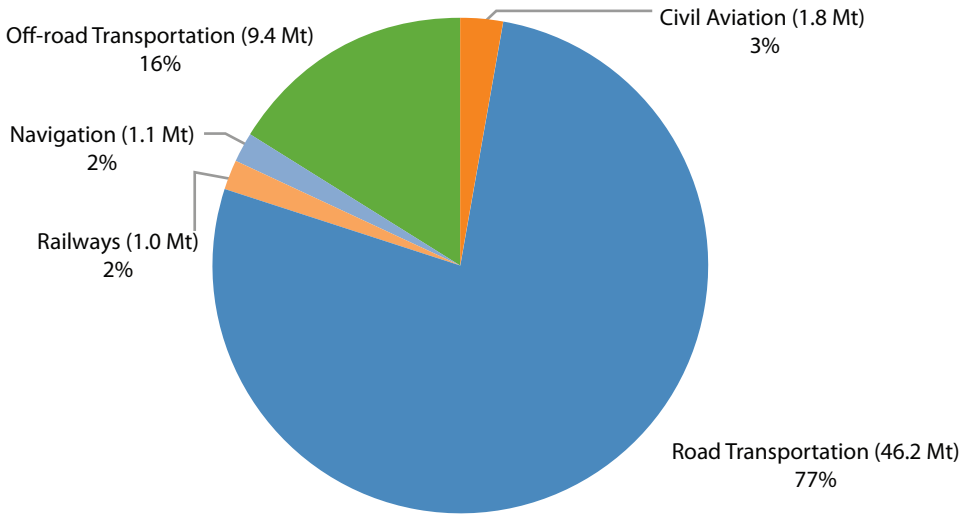


Sources: For gasoline sales: Statistics Canada. *Table 134-0004 – Supply and disposition of refined petroleum products, monthly (cubic metres)*, CANSIM (database). For road transportation GHG emissions: Natural Resources Canada. *Comprehensive Energy Use Database Table – Transportation Sector – Ontario, Table 9: Road Transportation Secondary Energy Use and GHG Emissions by Energy Source*. Note that 2010 and 2011 road transportation GHG emissions were estimated using average historical emissions factors.

The transportation sector includes emissions from fuel combustion for the transportation of both passengers and freight in five areas: on-road transportation, off-road transportation, domestic aviation, domestic marine and railways (Figure 10).

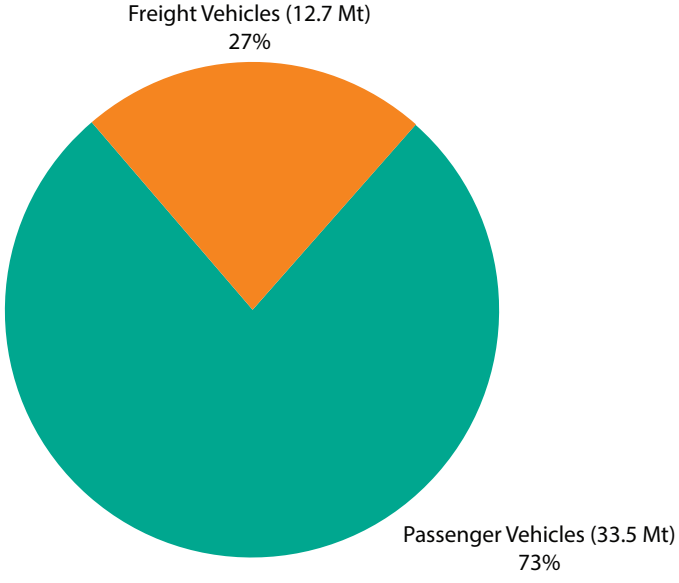
The largest subsector within the transportation sector is road transportation (Figure 10). With 8.7 million vehicles registered in Ontario, this subsector was responsible for 77 per cent of the sector's emissions in 2010. Of this amount, passenger vehicles were responsible for 73 per cent of on-road emissions, with freight (heavy-duty gasoline and diesel vehicles) representing 27 per cent (Figure 11).

Figure 10: 2010 Transportation Emissions, 59.5 Mt total



Source: Environment Canada (2012). *National Inventory Report – Greenhouse Gas Sources and Sinks in Canada 1990–2010*. Part 3, p. 61.

Figure 11: Road Transportation, 46.2 Mt total



Source: Environment Canada (2012). *National Inventory Report – Greenhouse Gas Sources and Sinks in Canada 1990–2010*. Part 3, p. 61.

Higher emissions have resulted from both an increase in the overall total number of passenger vehicles and the number of vehicle-kilometres travelled.

Passenger vehicles

While there has been a trend toward improved vehicle fuel efficiencies,[9] and thereby a decrease in the volume of GHG emissions per vehicle-kilometre travelled, this has been offset by other developments. Higher emissions have resulted from both an increase in the overall total number of passenger vehicles and the number of vehicle-kilometres travelled. As well, this trend has been exacerbated by a corresponding longer-term shift away from cars toward light-duty trucks, such as sport-utility vehicles, pickups and minivans. Accordingly, the relative volume of GHG emissions from cars has gone down, and the amount due to light-duty trucks has increased (Figure 12).

Freight

Over the past several decades, there has been a significant increase in freight transportation in North America, particularly due to increased trade. There has been a similar increase in road-based freight transportation; in Ontario alone, the number of heavy-duty on-road diesel vehicles more than doubled between 1990 and 2008. Within the Greater Toronto and Hamilton Area, for example, between 70 and 90 per cent of freight is moved by trucks, and the number of trucks on the road continues to grow.

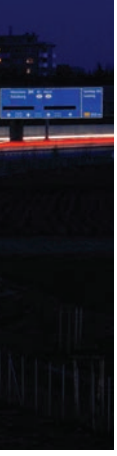
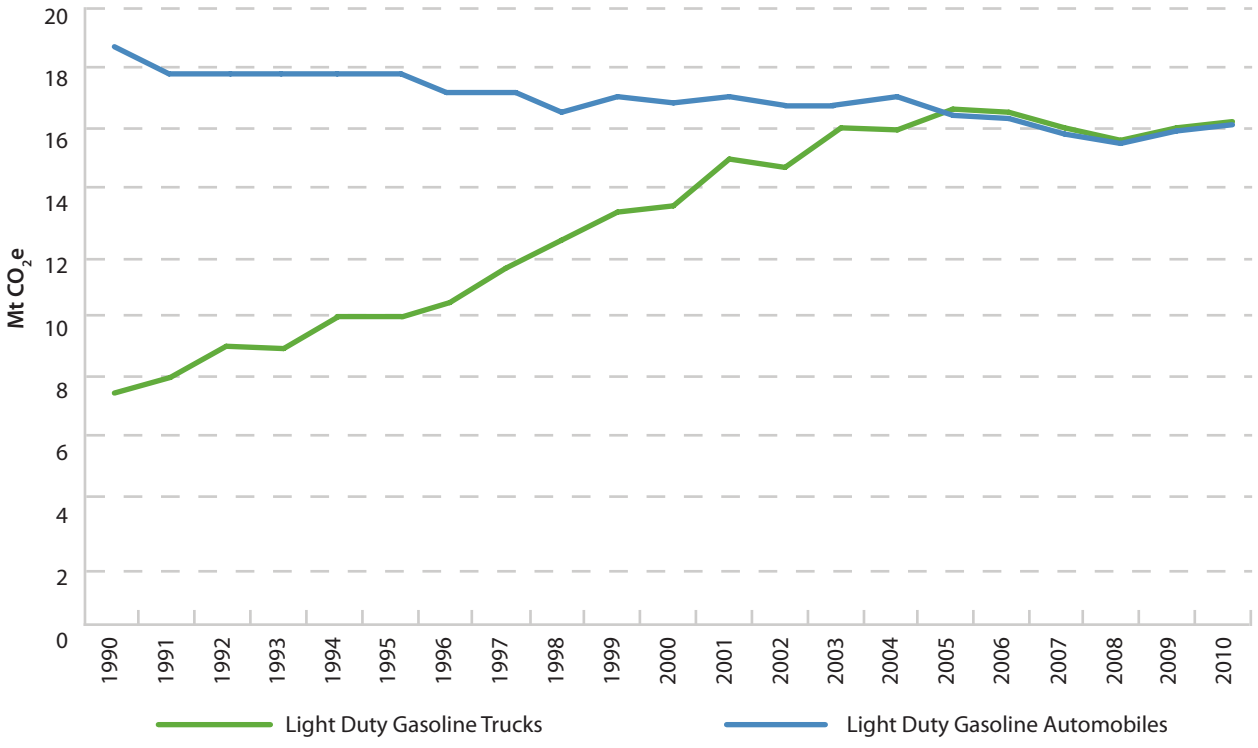


Figure 12: Light-duty Gasoline Automobile versus Light-Duty Gasoline Truck Emissions in Ontario, 1990–2010



Source: Environment Canada (2012). *National Inventory Report – Greenhouse Gas Sources and Sinks in Canada 1990–2009*. Part 3, p. 61. NB: Pre-2000 data derived from earlier National Inventory Reports.

This is problematic from a climate change perspective given that freight trucking causes approximately five times the level of GHG emissions per tonne-kilometre compared to rail. As a result, road-based freight transportation emissions represent 91 per cent of provincial freight emissions; rail is responsible for only 6.3 per cent.

Off-road

In 2010, off-road transportation contributed 9.4 Mt, or 16 per cent of total provincial transportation GHG emissions. Included in this category are emissions from heavy mobile equipment (used in construction, agriculture, mining and logging) and recreational vehicles (such as snowmobiles and all-terrain vehicles). In 1990, emissions from this subsector were 5.6 Mt. This increase of 68 per cent since 1990 is much greater than the average 30 per cent increase across the broader transportation sector.

The environmental and health benefits associated with plug-in electric vehicles – such as decreased emissions, reduced fossil fuel consumption and increased energy efficiency – can be significant, particularly in jurisdictions where electricity supply is relatively low-carbon.

Provincial Transportation Policies and Programs – a Review of Progress over the Past Year

Over the past few years, various policy tools (such as financial incentives, direct spending and regulations) have been employed by the provincial government to help reduce emissions from transportation. With a view to determining what progress has been made over the past year, the ECO reviewed the following programs and policies that have either been altered in some manner, or have come into existence, within this time period:

- Green Commercial Vehicle Program
- Electric Vehicle Incentive Program and Electric Vehicle Charging Infrastructure initiative
- High Occupancy Vehicle Lanes
- High-Speed Rail
- Heavy Truck Speed Limiters
- Long Combination Vehicle Program
- Transit-Supportive Guidelines
- the Ministry of Transportation's Sustainability Strategy and Sustainability Implementation Plan

Financial Incentives

Green Commercial Vehicle Program (GCVP) – Program ended early

Announced in August 2007, this four-year $13.9-million grant program was designed to reduce GHG emissions from commercial fleets. Two forms of grants were offered: $11 million was made available for purchases of hybrid and alternative fuel vehicles, and $2.9 million was made available to purchase anti-idling devices for heavy-duty trucks. The program was projected to result in a total reduction of 0.02 Mt of GHG emissions by 2020. In total, $4.7 million was awarded through the program.

The GCVP also contained an educational component: the data collected are to be analyzed and evaluated to determine the impact of the program on fuel consumption and GHG emissions, and subsequently made available to the public. While this has not yet occurred, the ECO is encouraged by preliminary data provided by the Ministry of Transportation (MTO) that show, over the operational lifespan of the vehicles and anti-idling devices purchased through the GCVP, 18.2 million litres of fuel will be saved and a total of 0.07 Mt of GHGs will be avoided.[10]

Electric Vehicle Programs – Financial support has been scaled back

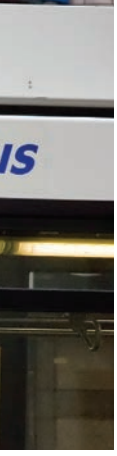
The environmental and health benefits associated with plug-in electric vehicles (PEVs)[11] – such as decreased emissions of greenhouse gases and air pollutants (i.e., particulate matter and ozone precursors), reduced fossil fuel consumption and increased energy efficiency – can be significant, particularly in jurisdictions where electricity supply is relatively low-carbon.

In an effort to harness this potential, the Ontario government set a goal, in July 2009, that one in 20 (i.e., 5 per cent) passenger vehicles in the province be electrically powered by 2020; an equivalent goal was established for the Ontario public service vehicle fleet. As well, the government indicated its intention to provide public charging infrastructure at government facilities and GO Transit parking lots.[12]

Given the significant GHG reductions that are associated with increased PEV market share, the ECO believes this is an initiative that requires patient, continued support. The transition to electric vehicles will likely take decades to be fully realized, and there will be bumps along the way.

To drive the uptake of electric vehicles, an Electric Vehicle Incentive Program was established and approximately $84 million was earmarked for the period July 1, 2010 to March 31, 2015.[13] As well, green license plates were developed, which allow electric vehicles access to high occupancy vehicle lanes even when there is just one person in the vehicle. MTO is tracking its "1 in 20" goal through incentive program grants and the number of special license plates issued. As of July 2012, 405 consumer incentives had been granted, and 542 green license plates had been issued.[14]

In August 2011, the Premier announced $80 million in seed funding to "spur the development and investment in electric car charging stations" by the public and private sectors. Up to $20 million per year was to be made available over a four-year period beginning in 2012–2013. More recent indications suggest that the government is reassessing where this commitment fits within the "scope of its overall priorities."[15] This was reflected in a request for information issued by Infrastructure Ontario in May 2012 seeking feedback as to which areas of the



charging infrastructure should be prioritized given the context of a "slowing economy and shrinking revenues."[16] Furthermore, the provincial budget documents for 2012–2013 indicate that the Electric Vehicle Incentive Program had a less-than-expected uptake and, therefore, is to be combined with the Electric Vehicle Charging Infrastructure initiative "to improve effectiveness and efficiencies."[17] In total, $43.1 million is to be eliminated from the program budget over the next three years. For the current fiscal year, MTO has indicated that $11.8 million has been budgeted for the combined electric vehicle infrastructure program and incentives program.[18] As well, MTO has begun a mid-program review[19] to assess "program eligibility criteria, a potential sunset date and overall program effectiveness."[20]

While increased market penetration by electric vehicles will do nothing to address other serious environmental issues associated with automobile production and use (such as congestion, urban sprawl, wildlife mortality and aggregate use for highway construction), it does form a critical piece in the long-term shift toward less carbon-intensive forms of transportation. For the more than 87 per cent of Ontario's population that regularly commutes 60 kilometres or less per day round trip,[21] PEVs may represent a viable option. As such, given the significant GHG reductions that are associated with increased PEV market share, the ECO believes this is an initiative that requires patient, continued support. The transition to electric vehicles will likely take decades to be fully realized, and there will be bumps along the way.

Direct Spending – Infrastructure

High Occupancy Vehicle Lanes – Slower movement toward faster lanes?

In congested areas along several 400-series highways and the Queen Elizabeth Way, high occupancy vehicle (HOV) lanes have been established to allow multi-occupant vehicles to travel more quickly. By encouraging carpooling and the use of public transit, the aim is to reduce congestion, travel times and emissions. According to MTO, these lanes have an average occupancy rate of 2.05 passengers per vehicle.[22] Figure 13 indicates the average travel time savings per trip associated with select HOV lanes in the Greater Toronto Area (GTA) during peak periods.

Figure 13: Traffic Volumes and Average Time Savings in GTA HOV Lanes

Highway/ Direction	Time Period	Volume (vehicles/hr)	Average Travel Time (General Purpose Lane)	Average Travel Time (HOV lane)	Average Travel Time Savings Per Trip (General Purpose Lane vs. HOV lane)
403 Eastbound	a.m. Peak Hour	1,100	18 min	11 min	7 min
403 Westbound	p.m. Peak Hour	1,300	12 min	8 min	4 min
404 Southbound	a.m. Peak Hour	1,300	12.5 min	7 min	5.5 min
404 Northbound	p.m. Peak Hour	1,400	14 min	8 min	6 min
QEW Eastbound	a.m. Peak Hour	800	17 min	11.5 min	5.5 min
QEW Westbound	p.m. Peak Hour	1,250	18 min	12 min	6 min

Source: Ontario Ministry of Transportation, information provided to the ECO in response to ECO enquiry, August 10, 2012.

One year after HOV lanes were opened on the QEW, the number of carpoolers rose from 11 per cent to nearly 28 per cent of total commuters during morning peak hours. Strong enforcement is, of course, critical to the success of such lanes. The Ontario Provincial Police enforce the HOV lanes on the 400-series highways and, according to MTO, the occupancy violation rate on these lanes is between 5 and 10 per cent.[23]

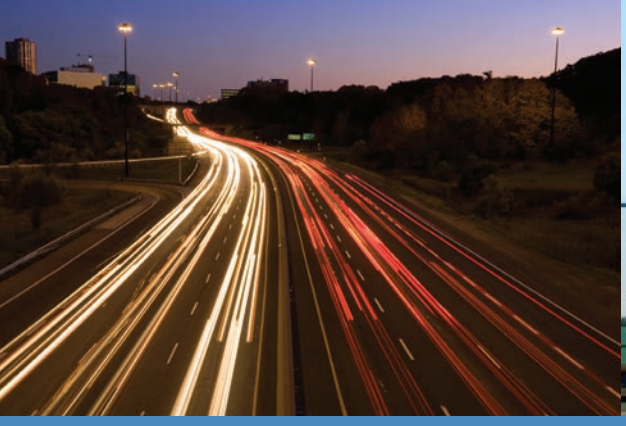
In 2007, the government developed a plan to create more than 450 lane kilometres of HOV lanes in the Greater Golden Horseshoe by 2031. To date, a total of 83 lane kilometres of HOV lanes have been constructed on provincial highways within the GTA and Ottawa.[24] According to the 2012 provincial budget, however, a small number of previously approved lane projects will be delayed, along with other planned HOV projects, until "fiscal capacity allows them to proceed."[25] According to MTO, this means that the construction of 31 lane kilometres of HOV lanes will be delayed.[26]

One year after HOV lanes were opened on the QEW, the number of carpoolers rose from 11 per cent to nearly 28 per cent of total commuters during morning peak hours.

High-Speed Rail – Sitting on the slow-speed shelf?

In February 2009, the federal government joined Ontario and Quebec in commissioning a $3-million study to update previous studies on the feasibility of high-speed passenger rail in the Quebec City-Windsor corridor. Previous studies had indicated that significant GHG reductions could be realized through such a project given that passenger vehicles represent the dominant mode of travel along the corridor.

In November 2011, the final report was made public. In reviewing all aspects associated with the construction and operation of high-speed rail service, the report found that travel times between major cities could be dramatically reduced, that annual revenues of $1.2 - $1.3 billion could be achieved by 2031, and that total development costs could range from nearly $19 - $21 billion depending on the locomotive technology used (diesel versus electric). Overall, it concluded that "from the point of view of the Ontario economy as a whole, all scenarios were shown to be economically feasible, except the Toronto-Windsor segment" depending on the technology.[27] From an environmental perspective, the study concluded that there would be significant reductions in GHG emissions (along with other criteria air contaminants) and corresponding economic benefits from such reductions.



To date MTO has not verified the impact that speed limiters have had on lowering GHG emissions.

While the federal government has ruled out funding the project due to fiscal constraints, the province has indicated its intention to review "innovative approaches to the next steps in planning the proposed high-speed rail link between Windsor and Quebec City."[28] Believing that enhanced rail must play a key role in reducing GHG emissions from the transportation sector, the ECO eagerly awaits the 'innovative approaches' that may be forthcoming. In this regard, the ECO notes with interest that California's High-Speed Rail Authority has identified funds from that state's emergent cap-and-trade program as a backup in the event that federal funding support falls short.

Regulation

Heavy Truck Speed Limiters – A success story?

Beginning in January 2009, most large trucks operating in Ontario have been required to use speed limiters that restrict their maximum speed to 105 kilometres per hour (km/h). Along with safety and cost considerations, lower speeds help reduce fuel consumption and GHG emissions. A reduction in speed from 115 km/h to 105 km/h serves to reduce the fuel consumption of an average truck by approximately seven per cent. If the same truck spent 75 per cent of its time on the highway, this 10 km/h reduction would result in a savings of 3,100 liters and 8.5 tonnes of GHG emissions per year. According to the government, approximately 100 million litres of fuel per year, the equivalent of 280,000 tonnes of GHG emissions, would be saved through the use of such devices.

In other jurisdictions where speed limiters have been required, a fairly large percentage of the devices have been tampered with, thus limiting the potential impact of the legislation. In our last GHG report, the ECO expressed concern that similar non-compliance rates might compromise provincial efforts. At that time, data suggested that 13.6 per cent of trucks were not in compliance with the legislation and either had not yet set the limiter or had installed devices that would circumvent the limiter. More recent inspections data from MTO indicate that the non-compliance rate has dropped slightly to 11 per cent.

In order to determine whether the legislation is actually having an impact and that trucks are, in fact, travelling at more fuel-efficient speeds on provincial highways, the ECO commissioned an independent study. Twenty-five different locations around the province were selected and over 4,000 trucks were monitored. In total, only 5.1 per cent of trucks were found to be travelling in excess of the designated speed.[29] Given these positive findings, the ECO would suggest that the speed limiter legislation has, therefore, resulted in some GHG reductions from this sector. To date, however, MTO has not verified the impact that speed limiters have had on lowering GHG emissions. The ECO encourages MTO to work toward evaluating the success of this program with regard to GHG reductions.

Long Combination Vehicle Program

In August 2009, MTO launched a one-year Long Combination Vehicle (LCV) pilot program to improve the efficiency with which goods are transported within the province. Once in receipt of a permit through the program, qualified carriers were allowed to operate extra-long vehicles on designated provincial highways. From an environmental perspective, such a program has an intuitive appeal – by combining two full-length semi-trailers with a single cab, more product can be transported, thus reducing fuel consumption and GHG emissions.

MTO conducted a review of the pilot program (which showed promising results across several indicators – environmental, economic and safety) and decided to continue allowing permitted vehicles on the road. Since August 2009, it has now been estimated that almost 3 million litres of diesel fuel has been saved and that a total of 8,300 tonnes – or 0.0083 Mt – of GHG emissions have been avoided.[30] At present, MTO is working on the next stages of the program; however this will likely require additional budgetary support.

Of significance to GHG mitigation is the continued absence of a discussion of road pricing for the improved function and funding of public transit systems.

New transportation initiatives

Over the past year, two new initiatives have been undertaken that, over a long-term horizon, may play a role in reducing emissions from the transportation sector.

Transit-Supportive Guidelines

In 1992, MTO developed guidelines to assist municipalities with land use and transportation planning. Recognizing that planning principles have changed over the past 20 years, MTO updated and expanded these guidelines and, in January 2012, released new Transit-Supportive Guidelines. With this tool, MTO hopes to provide "municipalities with ideas, tools and best practices to consider transportation and land use planning simultaneously in their local decision-making in order to develop more transit-supportive communities."[31] These guidelines are reviewed in our 2011/2012 Annual Report, Part 2.[32] Of significance to GHG mitigation is the continued absence of a discussion of road pricing for the improved function and funding of public transit systems.

MTO's Sustainability Strategy

Early in 2011 MTO released Sustainability inSight, the ministry's strategy to incorporate sustainability considerations not only into internal business practices, but also into the policies and programs that affect Ontario's transportation system. The ECO reviewed the strategy in our 2011/2012 Annual Report, Part 2.[33] With regard to climate change, the document explicitly acknowledges the major contribution that the transportation sector makes to provincial emissions, and that efforts are required to both shift to "less carbon-intensive forms of transportation" and to implement strategies that reduce the need to travel.[34]

The ECO believes the strategy could serve as a powerful catalyst for a long-term sustainability vision for the ministry. Whether or not that vision is realized, however, will depend in large part upon land use planning and infrastructure investment decisions that determine the viability of public transit and active transportation, rather than encourage private automobiles.

Achievement of the vision will also depend upon the specific actions and timelines that are articulated within regular Sustainability Implementation Plans. These plans are to be released to the public every three years. MTO has developed its first Sustainability Implementation Plan but, at the time this report was written, had yet to release it to the public. From a climate change mitigation perspective, the ECO encourages MTO to include specific actions and targets within the plans that are focused on reducing GHG emissions.

Industry

Industrial emissions trends and drivers

Greenhouse gas emissions are produced by a variety of industrial activities. Energy consumption and industrial production processes are the two main categories used to report emissions. In 2010, industrial energy consumption (excluding electricity) resulted in 24.5 Mt of emissions in Ontario, while industrial processes accounted for an additional 20.1 Mt. The combined total for the industrial sector was 44.6 Mt (Figure 14).

Emissions from this sector are influenced by output, production processes and the relative energy efficiency of industrial operations. Emissions have declined by 30 per cent, or 18.7 Mt, from 1990 levels. Between 1990 and 2007, the largest driver of reductions was reduced output in the petroleum refining and chemical subsectors. Within the chemical subsector the gradual discontinuation of adipic acid production in Ontario resulted in an 11 Mt reduction by 2009 (Figure 15a). Emissions reductions between 2007 and 2010 were driven by lower energy demand in the manufacturing subsector and, to a lesser extent, in the petroleum refining subsector, which was due to the global recession (Figure 15b).

Figure 14: 2010 Industrial Energy related and Process Emissions, 44.6 Mt Total

Figure 14a: Energy Consumption Related Emissions, 24.5 Mt

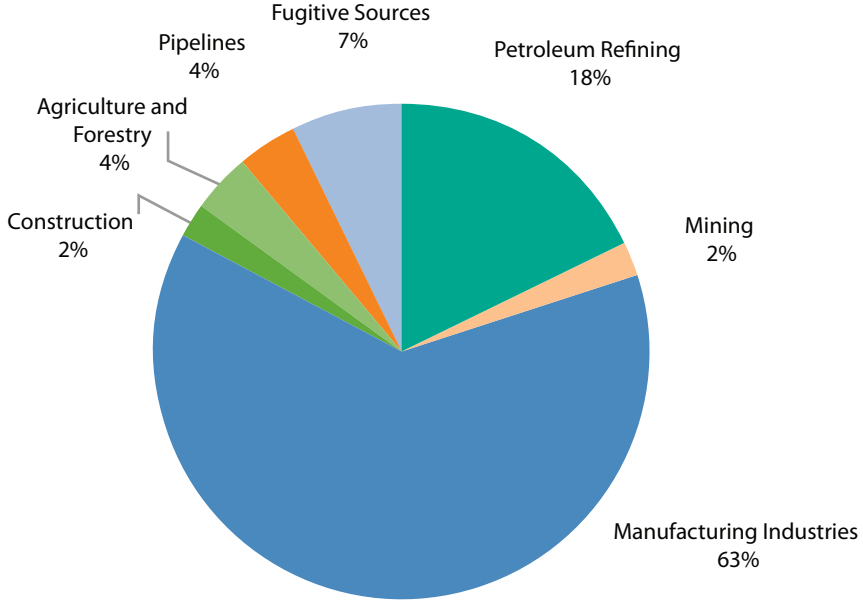
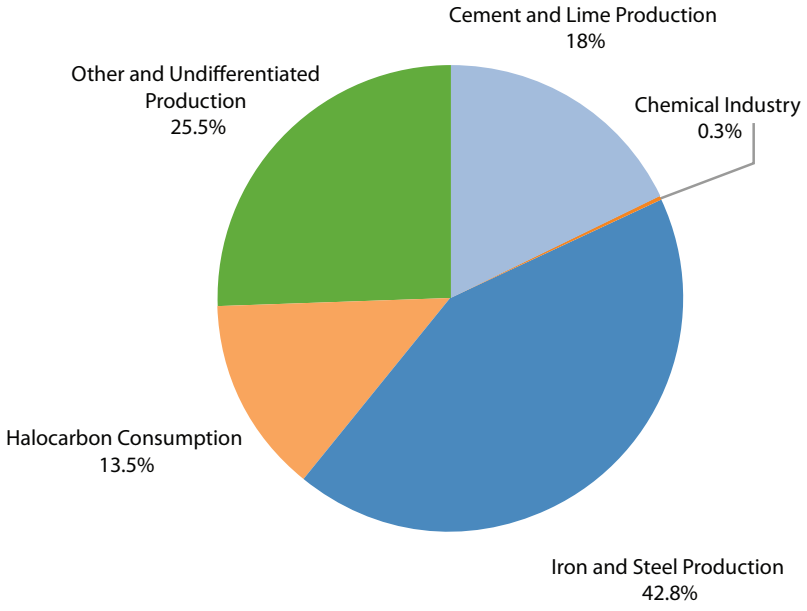


Figure 14b: Process Related Emissions, 20.1 Mt



Source: Environment Canada (2012). *National Inventory Report – Greenhouse Gas Sources and Sinks in Canada 1990–2010*. Part 3, p. 61. Statistics Canada (2012). *Supply and demand of primary and secondary energy in terajoules*, CANSIM Table 128-0016.

Figure 15: Change in Industrial Energy and Process Emissions, 1990–2010

Figure 15a: Change in Process Emissions

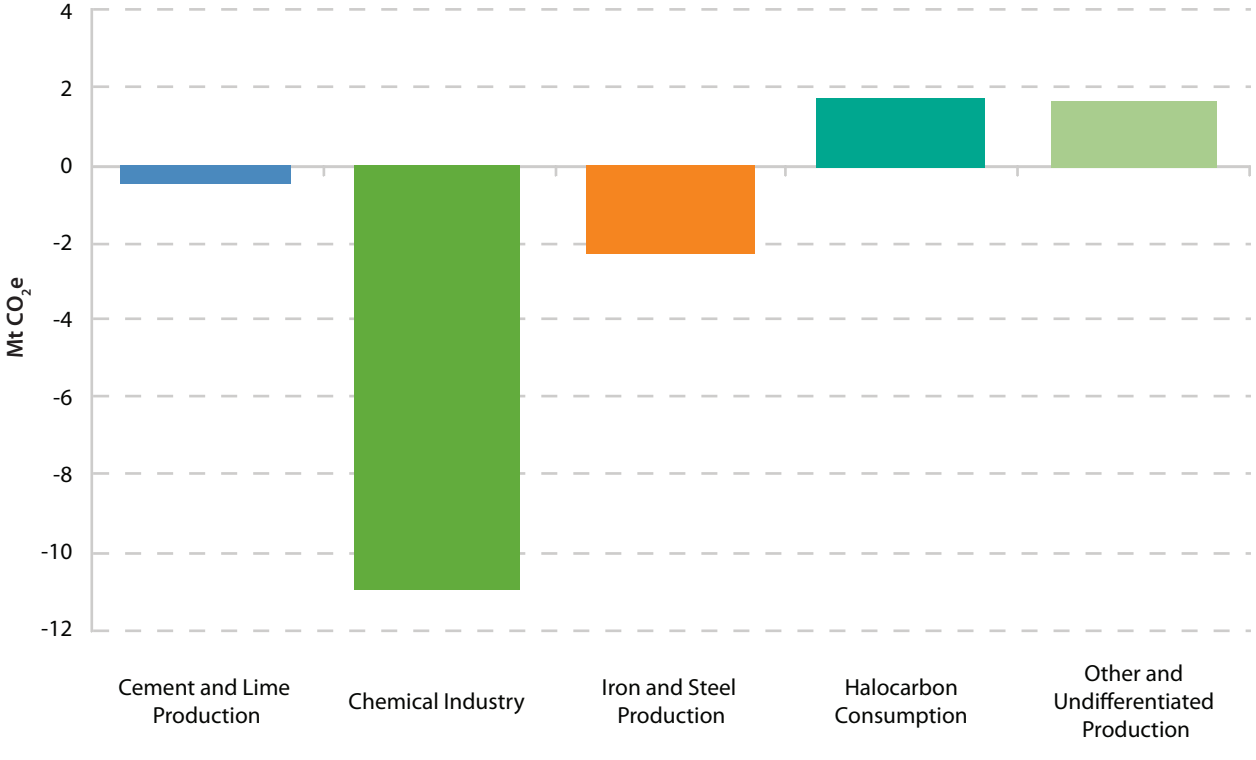
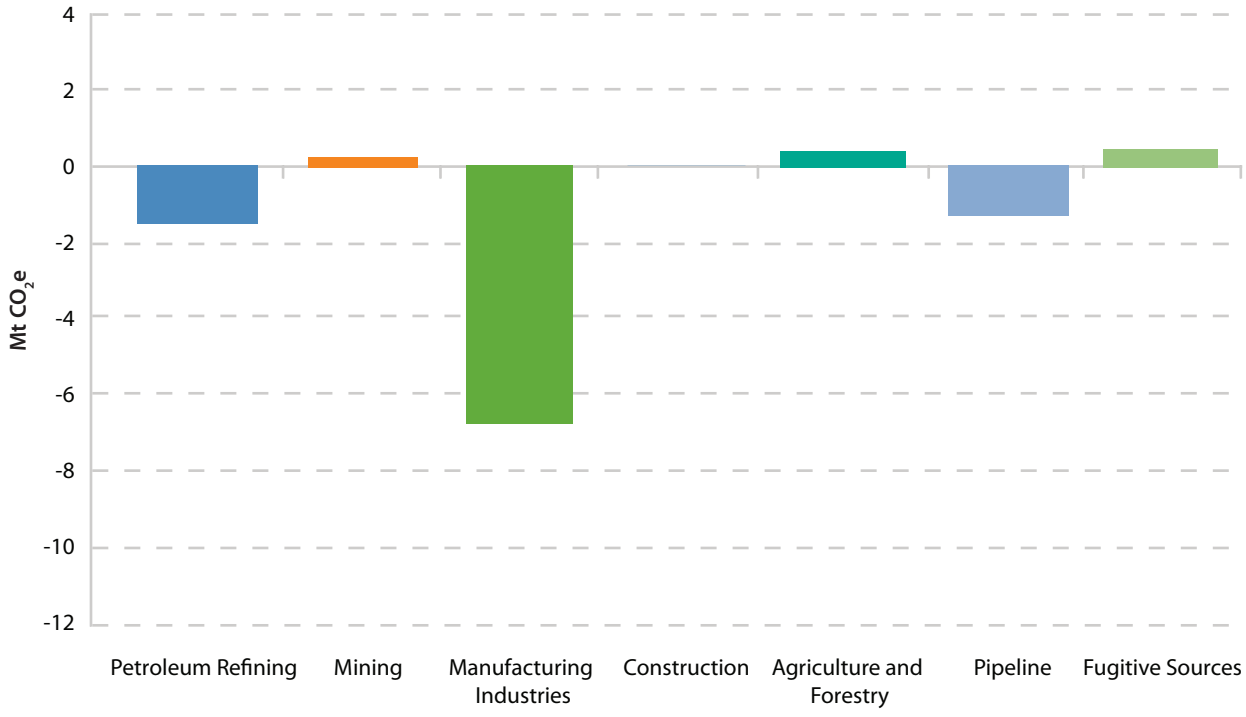


Figure 15b: Change in Energy Emissions

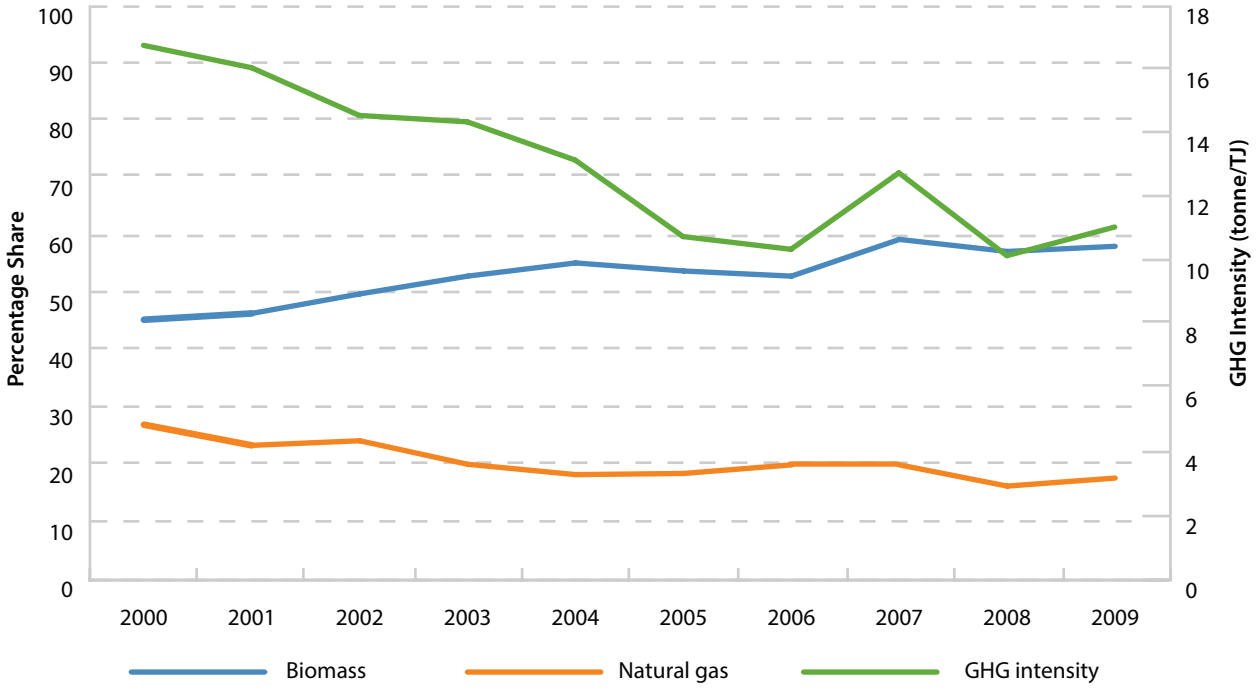


Source: Environment Canada (2012). *National Inventory Report – Greenhouse Gas Sources and Sinks in Canada 1990–2010*. Part 3, p. 61. Statistics Canada (2012). Supply and demand of primary and secondary energy in terajoules, CANSIM Table 128-0016.

While reduced industrial output has been the major driver of emissions reductions across the entire sector, fuel switching and energy efficiency improvements have been implemented in some subsectors. For example, through an increased use of bio-energy and a reduction in natural gas consumption, the pulp and paper subsector has reduced its overall GHG intensity (see Figure 16).

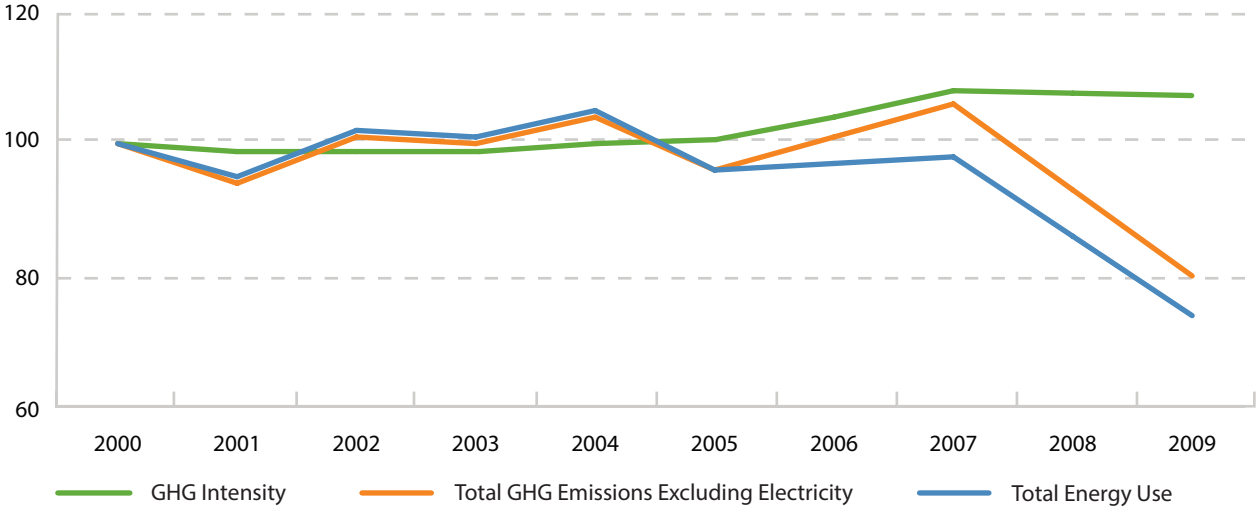
While overall energy use and absolute GHG emissions levels have declined within the industrial sector, the GHG emissions intensity (as measured in tonnes of GHGs per terajoule (TJ) of energy consumed) has actually increased (see Figure 17). Factors influencing this trend include the increasing volumes of heavy crude and oil sands (which are more energy intensive to process than conventional sources of crude) in Ontario's petroleum refining sector and fuel switching from grid-sourced electricity to on-site natural gas combustion across several subsectors.

Figure 16: Share of Natural Gas and Biomass in Pulp and Paper Energy Demand and GHG Intensity, 2000–2009



Source: Natural Resources Canada Office of Energy Efficiency (2011). *Comprehensive Energy Use Database – 1990 to 2009*. Industrial Sector, Ontario. Table 4: Pulp and Paper Secondary Energy Use and GHG Emissions.

Figure 17: Index of Ontario Industrial Energy Use, GHG Emissions and Intensity, 2000–2009



Source: Natural Resources Canada Office of Energy Efficiency. *Comprehensive Energy Use Database – 1990–2009*. Table: Industry Sector – Aggregated Industries – Ontario and Table 1: Secondary Energy Use and GHG Emissions by Energy Source.

Provincial Industrial Policies and Programs – a Review of Progress over the Past Year

Current policies that target industrial emissions include GHG reporting requirements, halocarbon regulations, and energy efficiency programs offered by the OPA and natural gas utilities. The first two will be addressed below; for a discussion of the natural gas utilities' industrial energy efficiency programs, refer to the ECO's Annual Energy Conservation Progress Report – 2010 (Volume Two), Section 3.1.[35]

GHG reporting

In December 2009, O. Reg. 452/09 – Greenhouse Gas Emissions Reporting, made under the *Environmental Protection Act*, came into force. Under this regulation, all facilities that exceed 25,000 tonnes of CO_2e emissions per year are required to report these emissions on an annual basis. The emissions reporting program was to be a precursor to establishing an emissions trading program in January 2012 in conjunction with other participating provinces and American states under the Western Climate Initiative. In April 2011, however, the Ontario government indicated that it would not begin participation in the trading program in 2012.[36] Despite this, facilities covered by the mandatory GHG reporting regulation were to have submitted their second annual reports (covering 2011 emissions) in June 2012 and, beginning this year, are required to have their data independently verified by an accredited third party.

On their own, emissions reporting requirements do nothing to address the sometimes significant economic barriers that limit GHG abatement in the industrial sector (e.g., high upfront capital investment, low fossil fuel costs and long life spans of infrastructure). The ECO nevertheless supports such requirements because of the necessary information they will provide to the government and outside stakeholders in developing a robust climate policy framework for Ontario's industrial sector. In this regard, the ECO notes that, at time of writing this report, neither the data submitted, nor the verification reports, had been made publicly available.

The emissions reporting program was to be a precursor to establishing an emissions trading program in January 2012 in conjunction with other participating provinces and American states under the Western Climate Initiative.

RECOMMENDATION:

The ECO recommends that the Ministry of the Environment make all data submitted pursuant to the greenhouse gas reporting regulation publicly available on an annual basis.

MINISTRY RESPONSE:

Ontario released the 2010 greenhouse gas emissions data on November 15, 2012, making it available to the public through the Ministry's website. The Ministry intends to make future emissions data available to the public on a regular basis.

Closer to home, emissions arising from HFC consumption has been the fastest growing category in Ontario's overall GHG inventory over the past 20 years.

Ozone-Depleting Substances and Other Halocarbon regulations

Halocarbons, such as chlorofluorocarbons (CFCs), hydrochlorofluorocarbons (HCFCs) and hydrofluorocarbons (HFCs) are used in refrigeration equipment, heat pumps and air conditioners, and as a blowing agent used in foam insulation. All of these substances are potent GHGs that are released into the atmosphere during their production and use (i.e., equipment leaks, improper maintenance and disposal methods). CFCs and HCFCs also deplete the ozone layer (i.e., they are ozone-depleting substances or ODSs); their production and consumption are controlled under the Montreal Protocol and are being phased out. HFCs, because they are benign to the ozone layer, have become the main alternative to ODSs. While there is no industrial production of these substances in Ontario, GHG emissions from the consumption of HFCs are nonetheless tracked under the industrial process emissions category in Environment Canada's National Inventory Report.[37]

In Ontario, the use of ODSs and other halocarbons is regulated by O. Reg. 463/10 – Ozone Depleting Substances and Other Halocarbons, made under the *Environmental Protection Act*. The regulation is designed to reduce the use of ODSs by phasing out CFCs in large refrigeration equipment and chillers, and limiting the use of both CFCs and HCFCs in motor vehicle air conditioners and refrigerators. The handling and disposal of non-ODS substitutes,

such as HFCs, is also controlled under the same regulation; however, there have been no limits placed on their use. Alternative refrigerants, including carbon dioxide and hydrocarbons (which are also global warming gases), are not covered by the regulation.

The phase-out of CFCs and HCFCs under the Montreal Protocol has resulted in GHG emissions reductions worldwide. However, emissions from the main replacement, HFCs, have been increasing globally. Closer to home, emissions arising from HFC consumption have been the fastest growing category in Ontario's overall GHG inventory over the past 20 years, increasing by more than 200 per cent from 0.85 Mt CO_2e in 1990, to 2.7 Mt CO_2e in 2010. While it is appropriate to phase out ODSs, the ECO is nonetheless concerned about the climate change implications of rising HFC use as a substitute in refrigeration and air conditioning applications. This is of particular concern because warmer temperatures occasioned by a changing climate are likely to drive increased demand for air conditioning and refrigeration. This increase in emissions can be mitigated however, using regulations, financial incentives and voluntary agreements. Such policy instruments are being used in many developed nations and the ECO believes there is an opportunity for further policy development in this area in Ontario. For example, HFC phase-out regulations are in place in several countries (e.g., Austria, Denmark and Switzerland) and Norway has implemented a tax rebate for the delivery of used HFCs and perfluorcarbons to destruction facilities that is based on the global warming potential of the gas returned.

RECOMMENDATION:

The ECO recommends that the Ministry of the Environment develop a strategy to better control greenhouse gas emissions from substitutes for ozone-depleting substances in all applications throughout their life cycles.

MINISTRY RESPONSE:

Ontario Regulation 463/10 prohibits the discharge of ODSs and their substitutes and requires that only trained personnel handle these materials. Ontario continues to be supportive of the phase-down of these materials as proposed by Canada, the U.S. and Mexico in their recent submission to the United Nations. We will continue to work with Canada on this issue through our participation in the national working group on ODS.

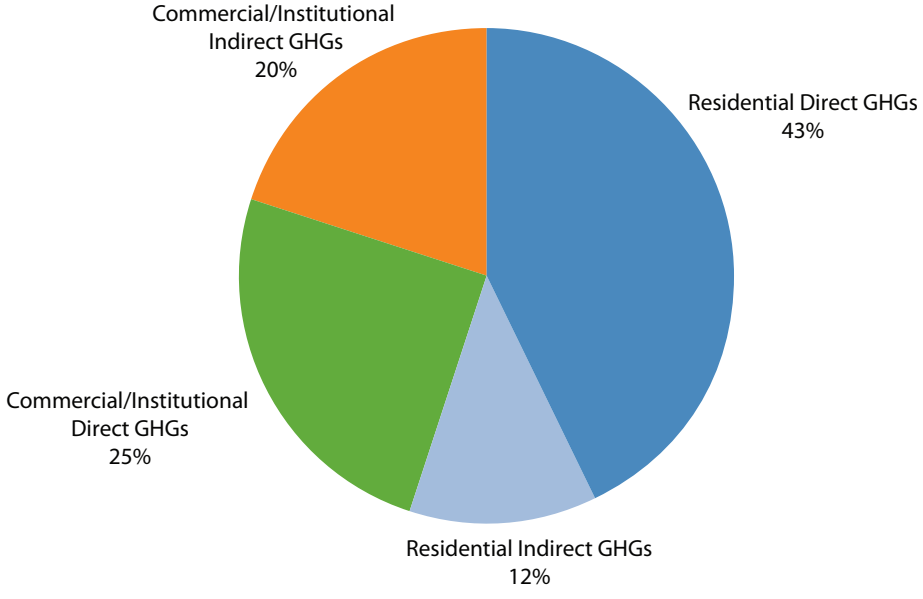
Buildings

Emission trends and drivers

In 2010, the building sector was responsible for 28.7 Mt of direct emissions from fossil fuel consumption for space and water heating. An additional 13.2 Mt of indirect emissions resulted from electricity consumption, for a total of 41.9 Mt. (see Figure 18).

Over the past 20 years, there has been a 31 per cent increase in floor space devoted to residential, commercial and institutional development (see Figure 19a). As a result, energy demand and emissions have increased over this time period. Since 1990, demand for natural gas in the building sector has increased by 34 per cent while electricity demand has increased at a more moderate rate of 15 per cent (see Figure 19b).

Figure 18: 2010 Direct and Indirect GHG Emissions from Buildings, 41.9 Mt



Source: Environment Canada (2012). *National Inventory Report – Greenhouse Gas Sources and Sinks in Canada 1990–2009*. Part 3, p. 61. Statistics Canada (2012). *Supply and demand of primary and secondary energy in terajoules*, CANSIM Table 128-0016.

Figure 19: Historic Trends in Building Floor Space, Energy Demand, 1990–2009

Figure 19a: Residential, Commercial and Institutional Floor Space

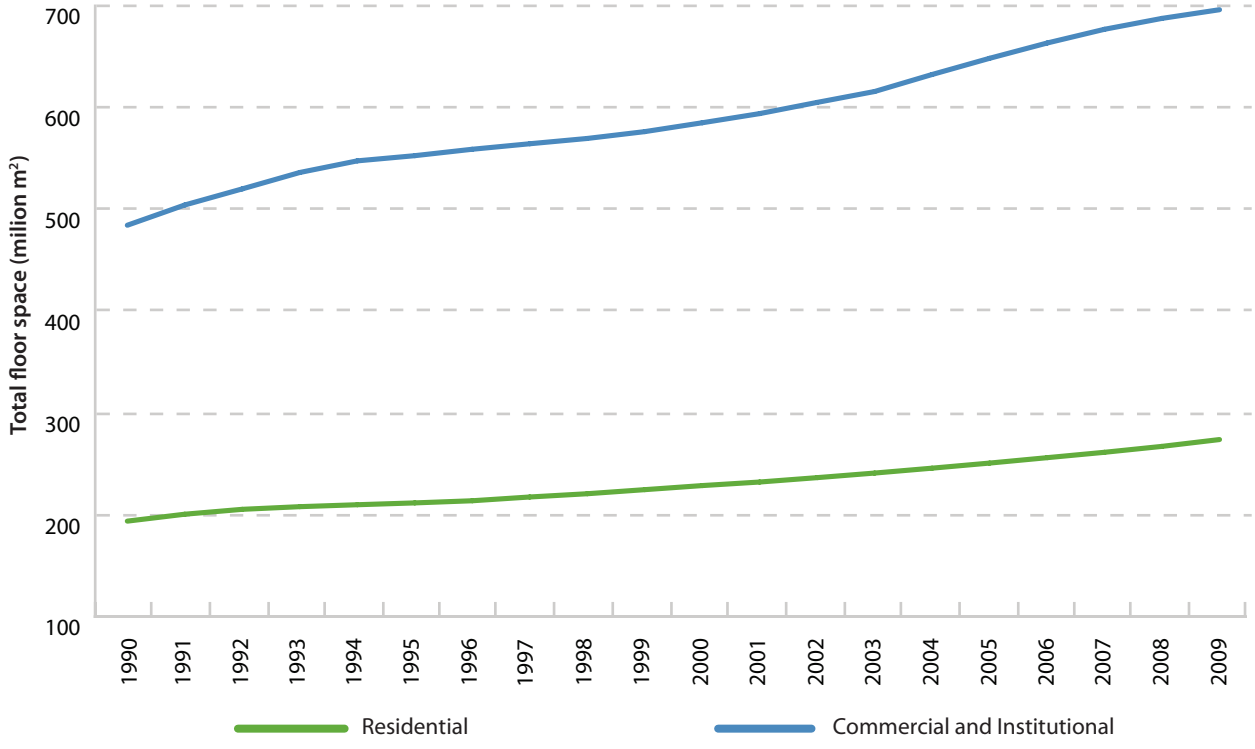
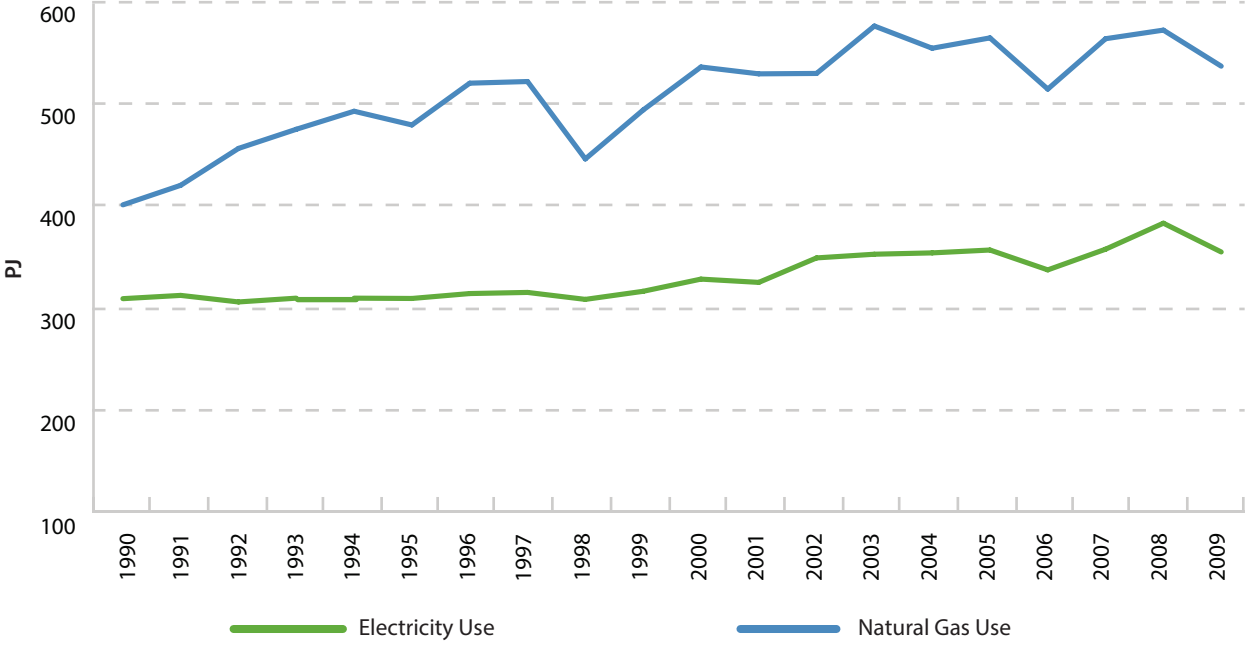


Figure 19b: Natural Gas and Electricity Use



Source: Statistics Canada (2012). *Supply and demand of primary and secondary energy in terajoules*. CANSIM Table 128-0016, Ontario. Energy use and floor space data: Natural Resources Canada Office of Energy Efficiency (2011). *Comprehensive Energy use Database, 1990–2009*. Residential Sector, Ontario. Table 1: Secondary Energy Use and GHG Emissions by Energy Source; Commercial/Institutional Sector, Ontario Table 1: Secondary Energy Use and GHG Emissions by Energy Source.

Building Policies and Programs – a Review of Progress over the Past Year

The discussion above indicates that, in order to cut GHG emissions in the building sector further, the government will need to focus its efforts on tools and initiatives to reduce the consumption of on-site fossil fuels. This can happen through continued efforts to improve the energy efficiency of building envelopes and lighting systems by updating the Ontario Building Code (OBC), and fuel switching for heat supply to electricity or renewable heating fuels, such as solar thermal, geo-exchange heat pumps and renewable natural gas (i.e., biogas).

Over the past year, the government has been working to update the OBC. The OBC is updated on a five-year cycle, with a lag time of several years to allow developers to catch up to the new provisions. The 2006 OBC improved the energy efficiency of new and substantially renovated homes by approximately 40 per cent over the previous version through a minimum energy performance standard, requirements for more energy efficient windows, higher insulation requirements and other features. Several of these key features only came into force in January 2012. Proposed amendments for the next version of the OBC are to come into force over the next five years and would raise minimum energy performance standards for small buildings by an additional 10-20 per cent and large buildings by 10-13 per cent.

Another proposed amendment would make GHG emissions reductions an explicit objective of the Code. The OBC represents an evolving body of standards and, as such, can play a key role in helping to reduce GHG emissions from the building sector as long as it is revised frequently so as to keep in step with technological innovation. As the ECO has previously recommended, the energy conservation amendments to the OBC should be reviewed more frequently than the current five-year cycle.[38]

Despite progress being made in updating the OBC, the ECO notes that, with regard to other policy initiatives affecting building energy use, there has been less forward movement. For example, in December 2011, the government backtracked on its commitment to ban inefficient light bulbs by 2012 – a measure it had previously identified as a tool to reduce GHG emissions. While the ban will now come into effect in January 2014, the delay represents a lost opportunity for additional emissions reductions.

Recent decisions by the Ontario Energy Board to freeze natural gas utility demand-side management budgets and deny pricing support for renewable natural gas (i.e., biogas) are regrettable.

Furthermore, reductions in indirect emissions associated with electricity use in the building sector have not been matched by similar reductions in direct emissions associated with the use of natural gas. As such, recent decisions by the Ontario Energy Board (OEB) to freeze natural gas utility demand-side management budgets and deny pricing support for renewable natural gas (i.e., biogas) are regrettable and may impede progress in this area.

Agriculture

The agricultural sector accounted for 10 Mt (6 per cent) of Ontario's GHG emissions in 2010. This total includes methane and nitrous oxide emissions from livestock and crop production. It does not include carbon sequestered or emitted by agricultural lands, nor does it include GHG emissions from on-farm energy use. All of these emissions are instead included in the relevant energy use sector category (i.e., transportation and buildings), while the production of synthetic fertilizer is included in the industrial sector. The focus in this section is on reviewing trends and drivers of emissions, as well as key policy developments in the agricultural sector.

Emission trends

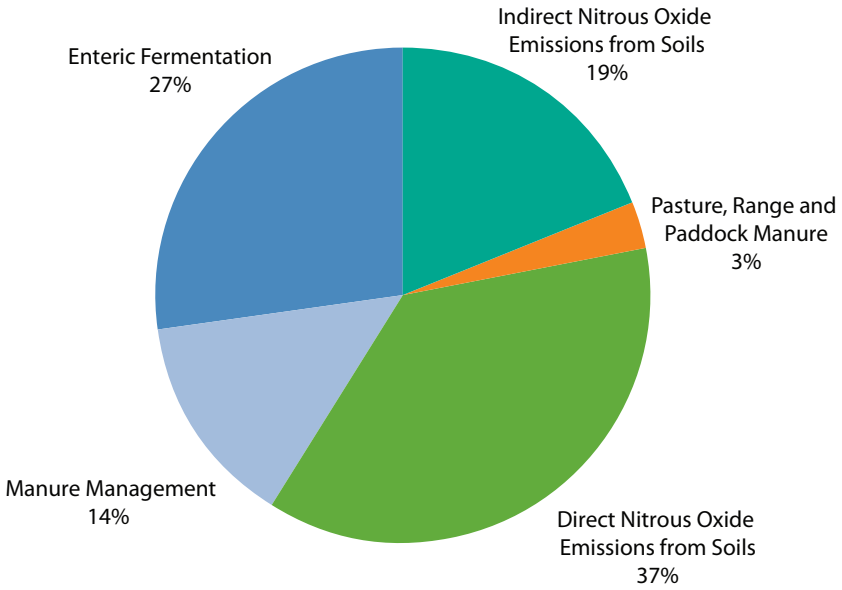
Nitrous oxide emissions from soils make up two-thirds of agricultural emissions. This category consists of emissions resulting from biological processes in soils, either:

- on-farm, following the application of nitrogen in the form of inorganic fertilizer, crop residues or manure (known as direct sources); or
- off-farm, following nitrate leaching or erosion (known as indirect sources).

The remaining third are methane emissions from livestock caused by enteric fermentation and manure management (see Figure 20). Agriculture accounts for about 70 per cent of all nitrous oxide and about 25 per cent of all methane emissions in Ontario. Again, CO_2 emissions from on-farm energy use are not included in this total (if included, these would add an estimated 2-3 Mt to the sector total).

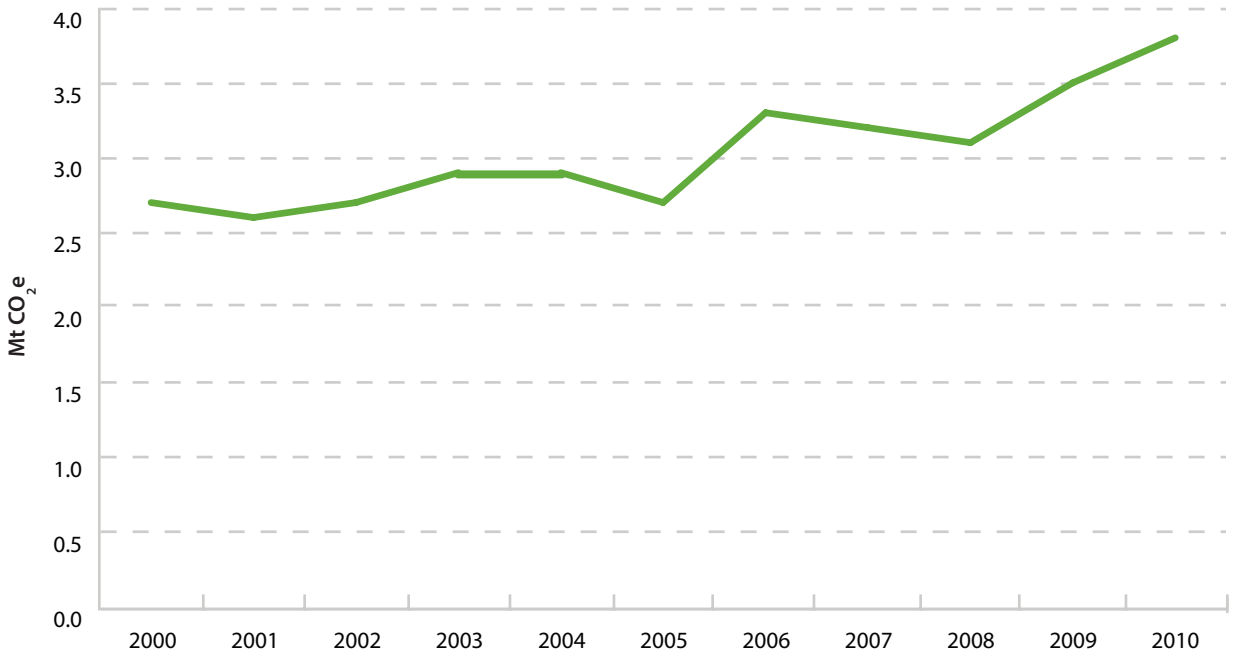
Overall, agricultural emissions rose slightly by 3 per cent in 2010 over 2009 levels, due to an increase in nitrous oxide emissions resulting from the application of synthetic fertilizers, manure and crop residue. All other source categories remained stable over the year. This continues a trend of rising nitrous oxide emissions from direct sources (fertilizer use and crop residues) that has occurred over the past decade due to rising crop production (see Figure 21).

Figure 20: 2010 Agricultural Emissions, 10 Mt total



Source: Environment Canada (2012). *National Inventory Report – Greenhouse Gas Sources and Sinks in Canada 1990–2010*. Part 3, p. 61.

Figure 21: Nitrous Oxide Emissions from Direct Sources, 2000–2010

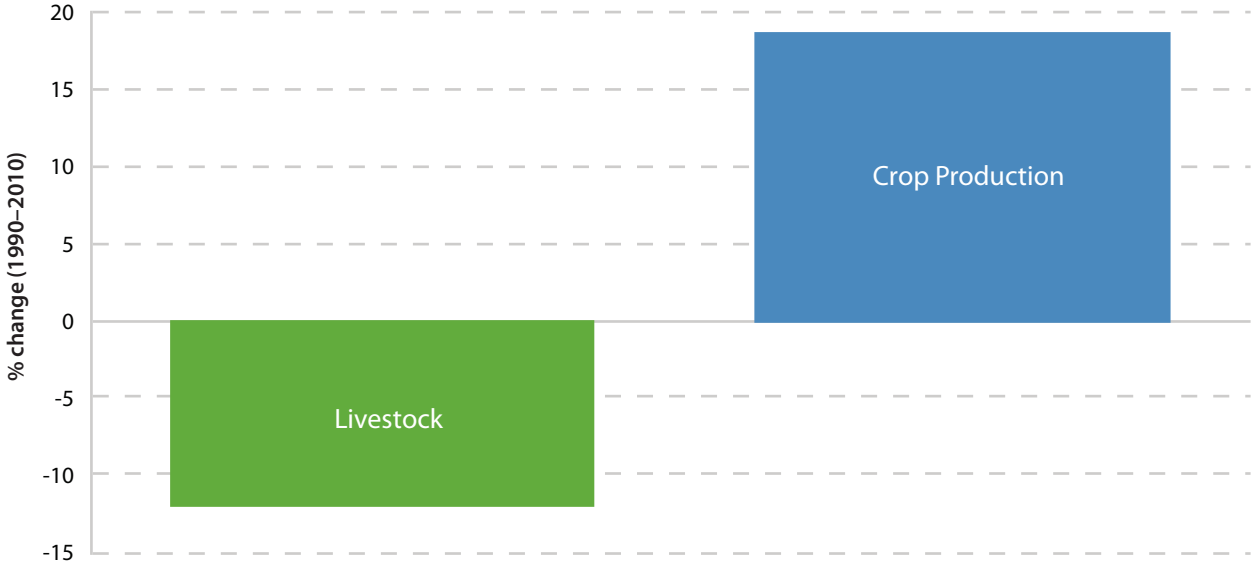


Source: Environment Canada (2012). *National Inventory Report – Greenhouse Gas Sources and Sinks in Canada 1990–2010*. Part 3, p. 61.

Concurrent with the long-term upward trend in nitrous oxide emissions from crop production (up almost 20 per cent from 1990 levels), there has been a decline in methane emissions from livestock (down 12 per cent from 1990 levels) (see Figure 22).

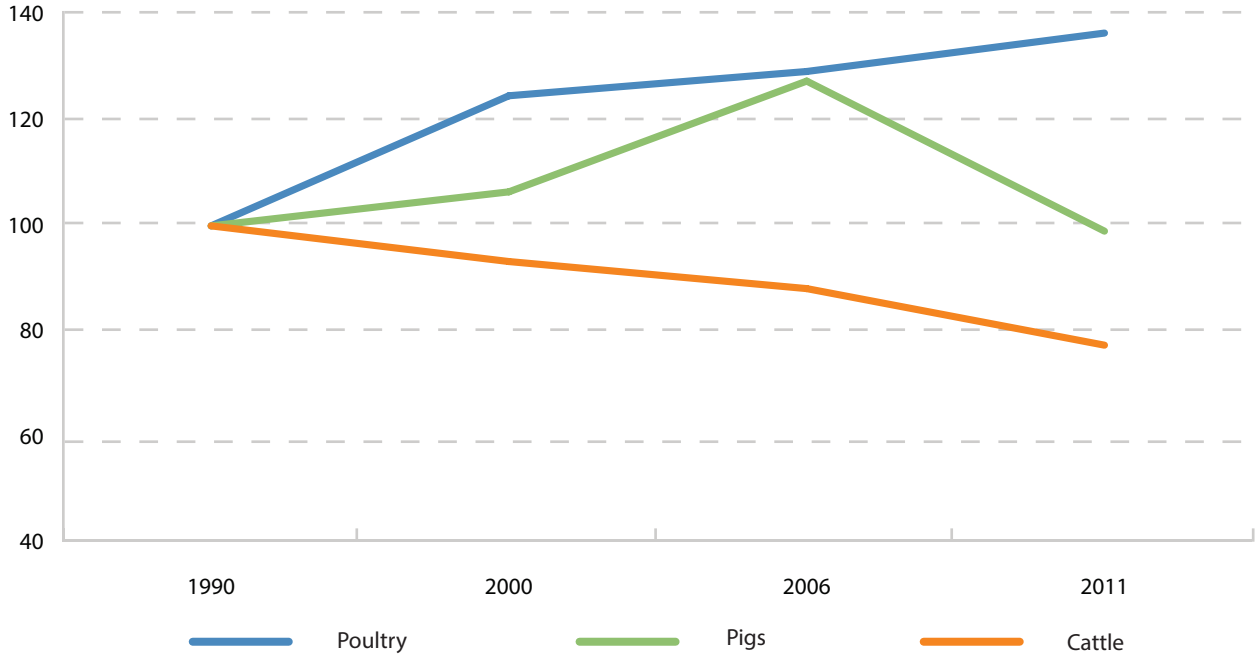
This decline is largely due to a 23 per cent decrease in Ontario's cattle population since 1990. Ontario's swine population increased by 22 per cent between 1990 and 2007, but has since dropped to 1990 levels, while the poultry population has increased by close to 40 per cent since 1990 (see Figure 23). Beef cattle are the most GHG-intensive livestock category, followed by dairy cattle, pork and poultry.

Figure 22: Percentage Change in Agricultural GHG Emissions by Source, 1990–2010



Source: Environment Canada (2012). *National Inventory Report – Greenhouse Gas Sources and Sinks in Canada 1990–2010*. Part 3, p. 61.

Figure 23: Index of Changes in Ontario's Livestock Population, 1990–2010



Source: Statistics Canada (2011). *Census of Agriculture*. Jayasundara, S. and Wagner-Riddle, C. *County Scale Inventory of Methane and Nitrous Oxide Emissions from the Agriculture Sector in Ontario*. Draft Final Report – July 2010. Prepared for the Ministry of the Environment, Ontario.

Agricultural sector abatement potential and opportunities

While there are no published estimates of the net GHG mitigation potential in Ontario's agricultural sector, at the North American level (taking into account all practices and all GHGs) the technical potential has been estimated to be between 200 and 600 Mt CO_2e by 2030.[39] Taking the average estimate (400 Mt CO_2e) and Ontario's portion of total farm area in North America (about 1.2 per cent), Ontario's agricultural sector could potentially contribute approximately 4.5 Mt of GHG reductions by 2030.[40] Admittedly this is a very rough estimate, and the economically achievable potential would be smaller; however, a significant number of agricultural GHG mitigation options have been found to be cost competitive with those in other sectors such as electricity and transportation.

When assessing GHG mitigation opportunities, it is critical to take a full life-cycle approach that accounts for unintended consequences of GHG emissions upstream or downstream in the agricultural system.

Opportunities for GHG reductions in the agricultural sector fall into three broad categories:

- *Reducing emissions* of nitrous oxide and methane through more efficient management of soils and livestock. For example, practices that deliver fertilizer to crops more efficiently can reduce nitrous oxide emissions, and managing livestock to make efficient use of feeds can reduce methane emissions.
- *Enhancing removals* of CO_2 from the atmosphere through improved soil management and/or conversion of marginal agricultural lands into grassland or forest, thereby withdrawing atmospheric CO_2 and sequestering it in soils.
- *Avoiding (or displacing) emissions* in other sectors through the production of bio-energy products from agricultural systems (i.e., ethanol, biodiesel or biogas).

When assessing GHG mitigation opportunities, it is critical to take a full life-cycle approach that accounts for unintended consequences of GHG emissions upstream or downstream in the agricultural system. For example, fossil fuel savings from biofuels can be offset by upstream crop production emissions. As well, converting forest and grassland to agricultural lands to support increased demand may result in further soil carbon emissions. When

considering these upstream and land-use change emissions, there is still considerable debate surrounding the full life-cycle impacts of corn-based ethanol production. This emphasizes the importance of continued research into the net GHG mitigation potential of opportunities in the agricultural sector to support policy development.

With this caveat in mind, there is sufficient data and knowledge to support the immediate implementation of many mitigation opportunities. For example, research on no-till and nitrogen fertilizer management practices in Ontario has found that the use of best management practices on a corn, soybean and winter-wheat rotation can reduce annual nitrous oxide emissions by an average of 36 per cent compared to conventional practices.[41] Despite this information, evidence shows that Ontario farmers continue to over apply fertilizer to their crops.[42] This suggests that an opportunity exists for GHG reductions if the proper incentives are provided through well-designed government policy. Agricultural GHG mitigation opportunities (based on commercially available technology and supported by research that demonstrates emissions reductions) could be applied to livestock management, manure composting and anaerobic digestion.

Provincial Agricultural Policies and Programs

The Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) has long promoted a voluntary approach to the management of environmental risks posed by agriculture; its approach toward climate change and GHG management is no different. With a view to determining what progress has been made over the past year, the ECO reviewed those programs and policies that form the provincial agricultural climate change mitigation strategy:

- Environmental Farm Plan
- Ontario Biogas Systems Financial Assistance Program

Environmental Farm Plan

OMAFRA provides technical support to the voluntary Environmental Farm Plan (EFP) program, which educates farmers about sustainable management practices and helps to identify priority actions to improve environmental performance. Cost-sharing funding for eligible projects is available through the Canada-Ontario Farm Stewardship Program. The EFP provides guidance on several practices that can mitigate GHG emissions or sequester carbon, including manure and fertilizer management practices, and agroforestry. However, as

the ECO highlighted in our 2010/2011 Annual Report, OMAFRA has not been able to quantify or estimate the effectiveness of the EFP program in meeting some of its environmental objectives.[43] GHG reductions associated with the EFP have also not been estimated.[44]

Given the evidence cited above that synthetic fertilizer use has increased over the past decade, and that Ontario farmers apply more than the recommended amount of fertilizer, the ECO believes that this program has been ineffective in reducing GHG emissions. As a key element of Ontario's GHG mitigation plan for the agricultural sector, the ECO would expect that OMAFRA would be able to demonstrate the results that the EFP program is achieving. This would require a program evaluation that measures the GHG outcomes from agricultural management projects supported by the EFP. The ECO recognizes the challenge in measuring GHG outcomes from agricultural management projects. Field-based sampling provides tangible results, but can be limited by costs and technical considerations and is, thus, perhaps best suited for innovative pilot projects. For evaluating the large-scale implementation of known and tested activities (such as those under the EFP), modelling approaches can be applied to provide reliable estimates of GHG reduction outcomes at the regional or even the farm scale. Farm-scale approaches are more complex to implement, but are an important prerequisite to the development of credible carbon offset protocols (see Box 3) to support the implementation of GHG reduction actions in Ontario's agricultural sector.

BOX 3: AGRICULTURAL CARBON OFFSET PROTOCOLS

In a number of jurisdictions, carbon trading programs require large industrial GHG emitters to acquire enough permits to cover their emissions in a given year. Typically, these programs also include carbon offsets that allow farmers to reap financial benefits by crediting them for implementing practices that store carbon in soils or reducing GHG emissions in their operations. In order to receive credits (or offsets), a farmer must prove that the emissions reductions (or storage) meet the requirements of the carbon trading program, which are detailed in offset protocols. These protocols typically include stipulations that the activities go beyond what is already required by law and what is already common practice, and that activities result in long-lasting carbon storage.

Given the central role that the Environmental Farm Plan program plays in Ontario's GHG mitigation plan for the agricultural sector, the ECO would expect that OMAFRA would be able to demonstrate the results that it is achieving.

Ontario Biogas Systems Financial Assistance Program

The Ontario Biogas Systems Financial Assistance Program (OBSFAP), which ran from September 2008 to March 2010, provided a total of $11.2 million for on-farm anaerobic digestion (AD) biogas systems. These systems capture and burn methane gas generated from on-farm organic residuals (such as manure stored in anaerobic lagoons) for heat and/or electricity generation. However, the capital cost and long payback periods of AD systems present a financial barrier to widespread implementation. Over 18 months, the program funded 46 feasibility studies and provided capital grants for the construction of 27 AD systems. Nineteen of these systems were built on dairy farms because these operations typically use anaerobic-lagoon manure management systems. Beef cattle and poultry farms mainly handle manure in solid form, which creates aerobic conditions that produce less methane than anaerobic-lagoon systems. It is estimated that the 27 projects reduced GHG emissions from manure management by 11 kilotonnes (kt) CO_2e – a 0.7 per cent reduction of emissions from manure management between 2010 and 2011.[45] These systems also have an installed electricity generation capacity of approximately 11 MW, which can contribute to further emissions reductions by offsetting natural gas consumption in the electricity sector.[46]

The ECO is concerned that there is no overall plan for GHG abatement in the agricultural sector.

The ECO considers the biogas program to have been a modest success in beginning the drive toward reduced emissions from manure management. However, with a total of 4,000 dairy farms in the province, there remains a significant amount of untapped potential. The Agri-Energy Producers' Association of Ontario estimates an emissions reduction potential of 0.5 Mt CO_2e exists from manure management through on-farm AD biogas systems.[47] This represents a 33 per cent reduction in emissions from manure management based on 2010 levels.

With the OBSFAP now ended, the only remaining financial incentive for the construction of on-farm AD biogas systems is the OPA's Feed-in Tariff (FIT) program. The FIT program pays 18.5-19.5¢/kilowatt-hour (kWh) for electricity produced by on-farm biogas systems and, thus, provides an important financial incentive. However, the ECO sees the potential for a perverse incentive for farm operations that have an aerobic manure management system to convert to an anaerobic system for the purpose of generating electricity. Some aerobic manure management systems, such as composting, can provide many GHG mitigation and carbon sequestration benefits, not to mention the benefits associated with healthy, high-organic-matter soils. Without proper valuation of these benefits, the FIT program could close the door to these practices.

The Need for a Comprehensive Plan

The ECO is concerned that there is no overall plan for GHG abatement in the agricultural sector. There are no emission reduction objectives, nor are policies in place that have, or will have, a demonstrable impact on the key drivers of GHG emissions, particularly the growing use of synthetic nitrogen fertilizers and emissions from livestock. The current voluntary approach does not address the full range of emissions abatement measures available in the agricultural sector and is not sufficient to stimulate the widespread changes to farming practices that are required to drive deep emissions reductions over the next several decades.

The ECO is pleased to note that MOE has revised downward its assumption about the capture rates of methane from landfill gas collection systems.

Waste

In 2010, the waste sector emitted 7.6 Mt, or 4.4 per cent of Ontario's overall emissions. Emissions were 22.6 per cent higher than the 6.2 Mt baseline from 1990, but just slightly below the 2009 level of 7.7 Mt. Fully 88 per cent of the 7.6 Mt total, or 6.7 Mt of CO_2e, is attributed to solid waste disposal on land – landfilling – and the resulting fugitive (or unintended) methane releases.[48] Government efforts to reduce landfill methane emissions have been to require all landfills with total capacity greater than 1.5 million cubic metres (m^3) to install gas collection systems to either flare the methane captured or use it to generate electricity.

A key factor in calculating landfill methane's contribution to the provincial GHG inventory is the assumed efficiency of landfill gas collection systems (i.e., the amount of gases they collect as a percentage of total gas produced). The ECO has cautioned that independent sources have reported that collection efficiencies average 40 per cent over the lifetime of a typical landfill.[49] The ECO is pleased to note, therefore, that MOE has revised downward its assumption about the capture rates of methane from landfill gas collection systems (also referred to as "collection efficiency") from 75 per cent to 55 per cent.[50] As shown in Figure 24, a reduction in the assumed rate of capture of methane from 75 per cent to 55 per cent (Scenario A compared to Scenario B), means that the total calculation of fugitive methane releases increases by 80 per cent.

The global warming potential (GWP) used for methane is an equally important factor in assessing the contribution of landfill waste to Ontario's GHG inventory. Ontario uses a 100-year GWP value of 21 for methane, a value derived from the IPCC's Second Assessment Report issued in 1995. In its 2007 Fourth Assessment Report, the IPCC updated the GWP value for methane to 25 to include more indirect warming impacts from methane. However, the continued use of the 1995 GWP value is consistent with the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, which recommends using the GWP value of 21 in order to provide a consistent time series of data. This has resulted in a significant misstatement of the current state of methane emissions to decision makers and the public.

If the more up-to-date GWP was, in fact, used this would mean that estimates of methane emissions from landfilling would be 19 per cent higher (Scenario C in Figure 24).

Figure 24: Implications of Different Capture Rates and Global Warming Potentials for Methane Fugitives

Implications of Different Capture Rates and GWPs for Methane Fugitives				
	Scenario			
Factors	**A**	**B**	**C**	**D**
Methane GWP	21	21	25	25
Methane Capture Rate	75%	55%	75%	55%
Oxidation Rate	10%	10%	10%	10%
Total Gas Generated (000 m^3/yr)	1,000	1,000	1,000	1,000
Methane Ratio	50%	50%	50%	50%
Outputs				
Fugitive Methane Releases (000 m^3/yr)	113	203	113	203
GHGs (Kt CO_2e/yr)*	1.60	2.88	1.90	3.43
CO_2e Change vs. Scenario A (%)	**–**	**80%**	**19%**	**114%**
*Assumes weight-to-volume ratio for CH_4 = 677 kg/1,000 m^3				

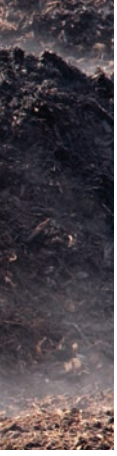
Source: Center for a Competitive Waste Industry, 2012.

To limit the generation of fugitive methane emissions the government must move expeditiously to prevent future organic residuals from entering landfill facilities.

The combination of a revision in the assumptions used about methane capture rates at Ontario's landfill sites, plus the application of the higher IPCC long-term GWP value for methane, suggests that the contribution of the waste sector to Ontario's GHG emissions inventory may be significantly underestimated. For example, applying Scenario D (combining both the lower capture efficiency and the higher GWP), more than doubles the contribution landfills make to the provincial GHG inventory from 6.7 Mt to 14.3 Mt.

In the past, the ECO has questioned the underlying rationale for methane collection and concluded that this is a barrier to increased diversion of organics from landfills. This, in turn, may be compromising Ontario's ability to meet a broader range of environmental management objectives, including GHG emissions reductions, soil quality enhancement, and the protection of groundwater sources from contamination.[51]

To limit the generation of fugitive methane emissions the government must move expeditiously to prevent future organic residuals from entering landfill facilities. At the same time, existing regulations must be strengthened to reduce the production of methane from those organics already in landfills. This is a particularly important



observation in light of recent scientific research regarding the short-term (20-year) GWP and related climate forcing implications of methane. The IPCC has indicated that, over a 20-year timeframe, the GWP of methane is almost three times greater than over a 100-year timeframe (72 vs. 25). In our 2011 Annual Greenhouse Gas Progress Report, the ECO concluded this near-term warming impact of methane "has serious implications for policies related to … the management of landfill gas."[52] Given these short-term impacts, mitigation strategies to curb releases of this gas over the next 20 years should have priority.

RECOMMENDATION:

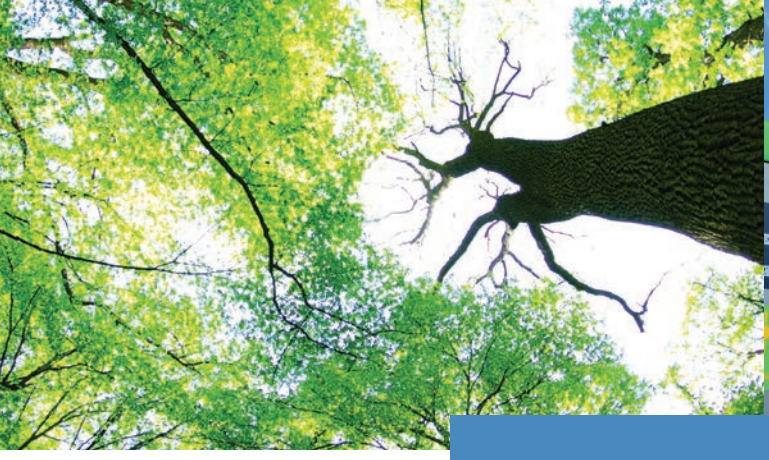
The ECO recommends that the Ministry of the Environment implement a phased-in ban on the landfilling of all organic residuals.

MINISTRY RESPONSE:

The Ministry continues to work on a long-term waste action plan and will review opportunities for the diversion of organics.

ECO Comment

3



Ontario's greatest opportunity to decarbonize its economy and achieve its target of 150 Mt by 2020 – and the much more challenging total emission level of 35 Mt by 2050 – lies in its low-carbon electricity supply.

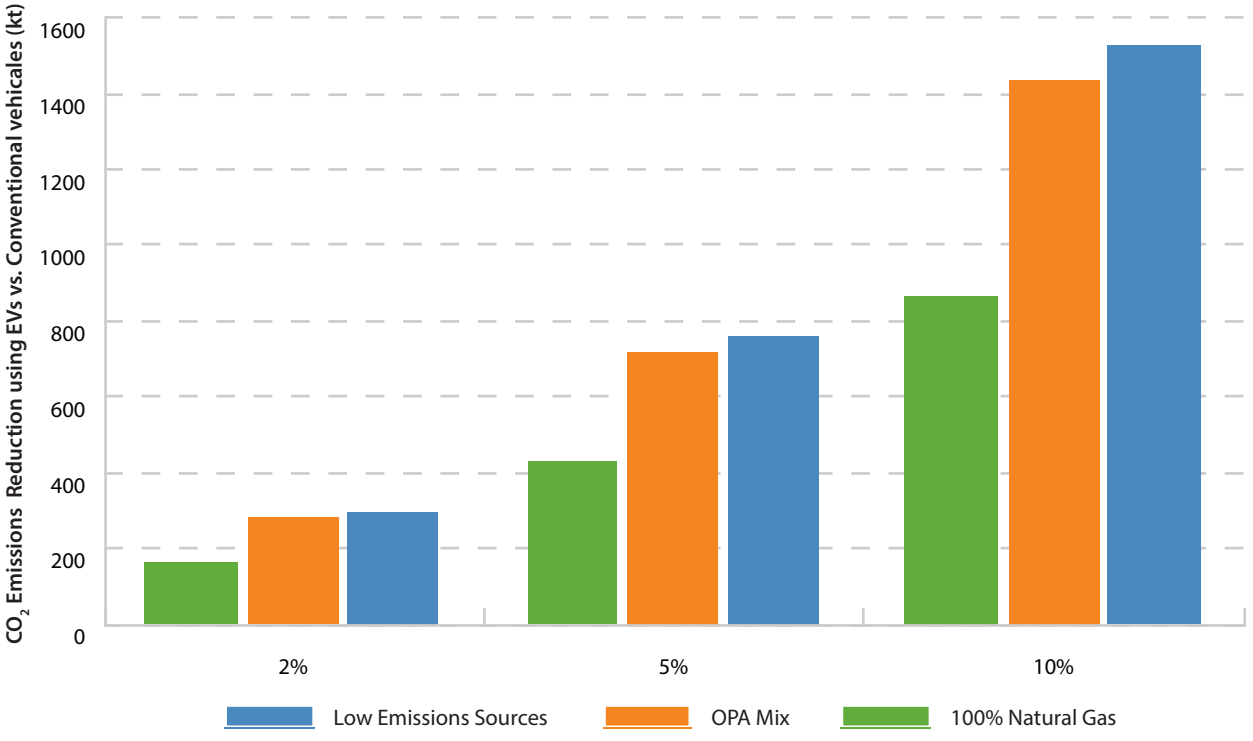
Opportunities

Ontario's greatest opportunity to decarbonize its economy and achieve its target of 150 Mt by 2020 – and the much more challenging total emission level of 35 Mt by 2050 – lies in its low-carbon electricity supply. If the province succeeds in increasing and improving this supply, it can be used as a substitute for fossil fuels in other sectors, such as transportation and industry, which continue to be major sources of GHGs.

To appreciate the significance of this opportunity, one has only to consider the example of the plug-in electric vehicle (PEV). Given Ontario's relatively low-carbon electricity supply, it has been estimated that a PEV would emit 17 grams of CO_2 per kilometre, significantly lower than either the 104-147 grams that would be emitted by two of the most efficient gasoline-powered cars on the market.[53]

While the ECO is not aware of any modelling that estimates the GHG reductions that would result from the widespread adoption of all types of EVs across Ontario, recent analysis done for the City of Toronto provides encouraging numbers.[54] Based on the assumption that one quarter of the EVs are commercial types, Figure 25 shows that a 10 per cent penetration rate within the city by 2020 could result in a reduction of up to 1.5 Mt of CO_2e emissions, depending upon the provincial electricity generation mix. Assuming that the number of vehicles registered in the City of Toronto represents 15 per cent of the provincial total, a 5 per cent province-wide penetration rate of EVs across the remaining 85 per cent of vehicles could make a significant contribution towards closing the 30 Mt gap at 2020.

Figure 25: CO_2 Emissions Reductions within the City of Toronto Using EVs Relative to Using Internal Combustion Engine Vehicles, by Electricity Generation Mix and EV Penetration Rate, 2020



Pollution Probe, *Unlocking the Electric Mobility Potential of Toronto: Moving Toward an Electric Mobility Master Plan for the City* (October 2010), p. 96. '100% Natural Gas' refers to electricity generation. 'OPA Mix' represents those emissions reductions achieved by charging EVs, on average, at 6:00 p.m. where the grid mix is based on the Long-Term Energy Plan's projected supply in 2020. 'Low Emissions Sources' represents nuclear, hydro and other renewables. (Revised as per personal communication; Pollution Probe, Nov. 2012)

A key barrier has been the reluctance on the part of the OEB to adopt a benefit-cost test that puts a price on carbon.

However, for this kind of abatement potential to be realized, climate change must become central to decisions about the future design of the electricity system; currently it is not. A key barrier has been the reluctance on the part of the OEB to adopt a benefit-cost test that puts a price on carbon. As the ECO previously argued, if the OEB had considered the environmental costs associated with the use of energy (particularly natural gas), it likely would have continued to require mandatory natural gas utility conservation programs that target the consumption of natural gas in the industrial sector. The OEB decision points to the need to ensure co-ordination between the carbon pricing instrument the government eventually pursues (cap-and-trade or carbon tax) and its energy conservation policies. A price on carbon would affect the OEB's screening of programs and targets with regard to natural gas and electricity conservation and, as such, would be an effective and transparent way to reduce emissions.

There are other opportunities to close the gap in the area of industrial energy efficiency. The Canadian Manufacturers & Exporters suggests that Ontario's industrial sector could cost effectively reduce its energy consumption by almost 30 per cent by 2030 by implementing economically feasible best practices that are readily available today.[55]

The government's failure to move forward with policy and program development under the Climate Change Action Plan is representative of a broader failure of leadership and governance.

Within specific energy-intensive subsectors there are options – such as increased recycling of steel, increased use of clinker substitutes in the cement subsector and reduction of flaring in refineries – that could drive substantial emissions reductions. Within the construction subsector, an increased use of wood provides an opportunity to sequester carbon and displace the use of carbon-intensive construction materials, such as steel and cement.[56]

One opportunity for GHG reduction that has been virtually ignored in Ontario (in stark contrast to many northern European countries) is the utilization of residual heat from electricity generation or industrial processes for space heating. This is not to be confused with high temperature steam produced by combined heat and power plants, which we do incorporate into industrial processes where appropriate. Rather it is the lower temperature heat produced by thermal power generation or industrial processes that is currently vented to the atmosphere via cooling towers or poured into waterways as cooling discharges. In many European countries, such practices would be seen as wasting heat that could be distributed kilometers away to displace the need for fossil fuel-fired space heating. Notwithstanding the efficiency of our natural gas furnaces, every opportunity to reduce fossil fuel burning takes Ontario closer to its targets.[57]

A Question of Commitment

The ECO believes that the government's failure to move forward with policy and program development under the Climate Change Action Plan is representative of a broader failure of leadership and governance. The Climate Change Secretariat lacked the decision-making authority to govern the Climate Change Action Plan as a cross-ministry initiative, became marginalized and is now essentially disbanded. In the government's April 2011 annual report, a designated team within Cabinet Office was identified as the entity that would co-ordinate the work of a Climate Change Results Table "as well as modelling and tracking of climate initiatives in general."[58] However, to the extent that there is no evidence that any new policies, initiatives or budget dollars are being committed to close the 30 Mt gap in any meaningful way, it would appear that this new body also has limited influence on government decision making.

In the Climate Change Action Plan, the government committed to report annually on progress in achieving emissions reduction goals, but these efforts to date have been characterized by inconsistent reporting dates and diminishing content, thus making year-to-year comparisons of progress difficult. Finally, the government has not established evaluation mechanisms for many of the individual policies and programs. Despite recognizing that "much remains to be done,"[59] the frustrating conclusion is that climate change is not a priority for this government. In short, these shortcomings are symptomatic of a climate change action plan that does not have the engagement or support of the Premier's Office and Cabinet. The ECO views this broader failure of governance as the major barrier to closing the 30 Mt gap.

The following excerpt from the Commission on the Reform of Ontario's Public Services ("Drummond Report"), while articulated in the context of the province's current fiscal challenges, is relevant here:

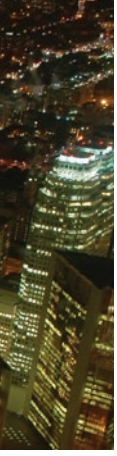
> Any transformational process, especially one that involves major expenditure management, must be led from the top. In the case of the Ontario government, this means that the centre of government — the Premier's Office and Cabinet Office — must be directly involved and provide strong leadership to the process for as long as it takes...[60]

The ECO believes that, for the Ontario government to achieve its goals, climate change must be treated as a transformational, cross-cutting issue...

The Drummond Report also recommended that a steering committee, supported by a secretariat within Cabinet Office, become the focal point for the government-wide work necessary to develop specific reforms for "*cross-cutting measures addressing themes that touch on multiple sectors*"[61] (emphasis added). The ECO believes that, for the Ontario government to achieve its goals, climate change must be treated as a transformational, cross-cutting issue that is factored into the decisions of this steering committee and Cabinet budget secretariat.

The ECO accepts that any strategic effort to reduce GHGs will require sustained resources and that there are competing priorities around the Cabinet table for these scarce resources – especially in light of the current deficit situation the government is facing. However, the ECO shares the view of a growing number of stakeholders – including many groups represented by large industrial emitters – who believe that a price on carbon would:

1. provide the resources needed for decarbonization initiatives;
2. reduce greenhouse gas emissions;
3. reduce uncertainty; and
4. help deliver on the government's green jobs and low-carbon economy objectives.



Other jurisdictions are demonstrating that this can be done without hurting economic growth, while reducing emissions and achieving important fiscal objectives. These jurisdictions are demonstrating that a carbon price is an efficient and effective way to drive emissions reductions across all sectors. Not only could a carbon price provide a boost toward provincial climate change objectives, but it could help achieve fiscal objectives and, as such, is a rare example of a win-win policy for the economy and the environment.[62]

RECOMMENDATION:

The ECO recommends that the government conduct an analysis of the environmental, social and economic impacts of alternative carbon pricing mechanisms and release it to the public for discussion.

MINISTRY RESPONSE:

Ontario has been clear that we are not developing a carbon tax. Emissions trading is an alternative carbon pricing approach. Ontario is developing a greenhouse gas reduction proposal which includes working with our Western Climate Initiative partners and stakeholders to develop a regional emissions trading program.

Endnotes

[1] International Energy Agency, *World Energy Outlook 2011: Executive Summary*, 2.

[2] Canadian Council of Chief Executives, *Clean Growth 2.0: How Canada can be a Leader in Energy and Environmental Innovation* (November 2010), 52.

[3] Note that the use of the collective term GHG refers to the following six gases: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), perfluorocarbons (PFCs), hydrofluorocarbons (HFCs), and sulphur hexafluoride (SF_6). Each gas has a different warming effect, which is referred to as its global warming potential (GWP). In order to compare the warming potential of each gas to CO_2, gases are converted to a CO_2 equivalent (CO_2e). This reflects how much CO_2 would be required to produce a similar warming effect. Within this report, the terms GHG and CO_2e are used interchangeably.

[4] In particular, the NRT modelled the following existing policies: coal phase-out; vehicle emissions standards; energy efficiency and demand-side management programs; improved building codes; renewable and/or low-carbon fuel standards; landfill gas regulation; and the Feed-in Tariff for renewable electricity.

[5] National Round Table on the Environment and the Economy, *Reality Check: The State of Climate Progress in Canada* (Ottawa, Ontario: 2012), 79.

[6] National Round Table on the Environment and the Economy, *Reality Check: The State of Climate Progress in Canada* (Ottawa, Ontario: 2012), 100.

[7] Note that electricity generation data presented here only includes generators connected to the Independent Electricity System Operator-controlled transmission system and, as such, does not count natural gas and renewables sources that are connected at the distribution level.

[8] International Energy Agency, *Tracking Clean Energy Progress: Energy Technology Perspectives 2012, excerpt as IEA input to the Clean Energy Ministerial*, (Paris: 2012).

[9] The key federal policies are the Passenger Automobile and Light Truck Greenhouse Gas Emission Regulations. These regulations establish progressively stronger fleet average GHG emissions standards for new vehicles sold in model years 2011–2016. According to the Regulatory Impact Analysis Statement, the projected, cumulative Canada-wide reduction in GHGs from these regulations is 92 Mt by 2016. Some analysts have questioned, however, whether the regulations actually require any improvement in the average fuel economy, relative to business-as-usual. It should also be noted that these regulations will still result in per kilometre GHG emissions that are significantly higher than those of several other countries, such as Korea, Japan and the European Union. For example, by 2016, the Canadian average fleet standard target is 153 g CO_2/km. By 2015, the target for the European Union is 130 g CO_2/km, with a further proposed reduction to 95 g CO_2/km by 2020.

[10] Ontario Ministry of Transportation, information provided to the ECO in response to ECO enquiry, August 10, 2012.

[11] Various plug-in electric vehicles are on the market. A battery electric vehicle (BEV) is one which derives its power solely from a rechargeable battery pack. Several BEVs are available in Ontario: Ford Transit Connect, Mitsubishi i-MiEV, Nissan LEAF and the smart fortwo Electric Drive. Plug-in Hybrid Electric Vehicles (PHEVs) have a battery pack, as well as an internal combustion engine (ICE). Each of these has electric outlets to replenish the batteries. An example of these is the Chevrolet Volt. Hybrid Electric Vehicles (HEV), such as the Toyota Prius and Honda Insight, do not have electric outlets to replenish the batteries, but rather the ICE is responsible for recharging them.

[12] As of August 2012, four GO Transit stations had conduits installed to accommodate recharging facilities. Five additional stations are being designed to accommodate such facilities. Ontario Ministry of Transportation, information provided to the ECO in response to ECO enquiry, August 10, 2012.

[13] Ontario Ministry of Transportation, information provided to the ECO in response to ECO enquiry, August 10, 2012.

[14] Ontario Ministry of Transportation, information provided to the ECO in response to ECO enquiry, August 10, 2012.

[15] Request for Information for Electric Vehicle Charging Infrastructure (RFI No. 12-045C) MERX website.

[16] Request for Information for Electric Vehicle Charging Infrastructure (RFI No. 12-045C) MERX website.

[17] Government of Ontario, *Addendum to the 2012 Ontario Budget: Report on Expense Management Measures*, 8.

[18] Ontario Ministry of Transportation, information provided to the ECO in response to ECO enquiry, August 10, 2012.

[19] Ontario Ministry of Transportation, information provided to the ECO in response to ECO enquiry, October 15, 2012.

[20] Ontario Ministry of Transportation, information provided to the ECO in response to ECO enquiry, August 10, 2012.

[21] According to the 2006 Census, the total number of all commuters in Ontario is 5,094,655. Of this number, 4,454,185 commuters live 30 kilometres or less from their usual workplace location and, therefore, have a total round trip of less 60 kilometres.

[22] Ontario Ministry of Transportation, information provided to the ECO in response to ECO enquiry, August 10, 2012.

[23] Ontario Ministry of Transportation, information provided to the ECO in response to ECO enquiry, August 10, 2012.

[24] Ontario Ministry of Transportation, information provided to the ECO in response to ECO enquiry, August 10, 2012.

[25] Government of Ontario, *Addendum to the 2012 Ontario Budget: Report on Expense Management Measures*, 49.

[26] The 31 lane kilometres comprises 7.3 km in each direction on Highway 427 between Highways 409 and 407 and 8.2 km in each direction on Highway 400 between Major Mackenzie Drive and King Road. Ontario Ministry of Transportation, information provided to the ECO in response to ECO enquiry, August 10, 2012.

[27] EcoTrain, *Updated Feasibility Study of a High Speed Rail Service in the Quebec City – Windsor Corridor*, Deliverable No. 13 – Final Report (February 2011), S-22. It is also noteworthy that a disclaimer was attached to the report indicating that there was an error in the comparative air fares used for ridership and revenue projections. The authors of the report indicated their belief that the "overall impact of using the corrected air fares could have been positive in terms of HSR ridership, revenues, cost-benefit and financial viability for the Quebec – Windsor corridor. The impact could have been quite different by segment or between city pairs, from minimal to significant."

[28] Government of Ontario, *Addendum to the 2012 Ontario Budget: Report on Expense Management Measures*, 20.

[29] Recognizing that there may be a lack of precision in the effectiveness of the speed limiters and the radar measurement, only trucks travelling at 108 km/hour and over were included in the study.

[30] Ontario Ministry of Transportation, information provided to the ECO in response to ECO enquiry September 10, 2012.

[31] Environmental Registry #011-1329, *Draft Update of Ontario's Transit-Supportive Guidelines* (January 14, 2011).

[32] Environmental Commissioner of Ontario, *Annual Report Part 2 2011/2012: Losing Our Touch*. (Toronto, Ontario: 2012), 89-94.

[33] Environmental Commissioner of Ontario, *Annual Report Part 2 2011/2012: Losing Our Touch*. (Toronto, Ontario: 2012), 147-150.

[34] Ontario Ministry of Transportation, *Sustainability insight: An innovative strategy for Ontario's Ministry of Transportation* (February 2011), 4.

[35] Environmental Commissioner of Ontario, *Annual Energy Conservation Progress Report – 2010* (Volume Two), *Managing a Complex Energy System – Results* (Toronto, Ontario: 2011), 38.

[36] Letter dated April 13, 2011 from John Mayes, Director, MOE Environmental Monitoring Reporting Branch, and Jim Whitestone, Director, MOE Air Policy and Program Design Branch, entitled: *Filing direction for Greenhouse Gas Emissions Reports Clarification on the use of the 2009 and 2010 Guidelines*.

[37] HFCs are a group of gases with global warming potentials (GWPs) ranging from 140 to 12,000 times that of carbon dioxide. HFC-134a, one of the most widely used non-ODS refrigerant blends, has a GWP that is 1,300 times the GWP of carbon dioxide.

[38] Environmental Commissioner of Ontario, *Annual Energy Conservation Progress Report – 2011 (Volume One) – Restoring Balance: A Review of the First Three Years of the Green Energy Act* (Toronto, Ontario: 2012), 27.

[39] Pete Smith et al., "Greenhouse gas mitigation in agriculture," *Philosophical Transactions of the Royal Society B,Biological Sciences*, 363, No. 1492 (February 2008).

[40] This is a rough estimate meant to illustrate the important role that the agricultural sector could play in achieving Ontario's GHG reduction targets.

[41] Claudia Wagner-Riddle et al., "Intensive measurement of nitrous oxide emissions from a corn-soybean-wheat rotation under two contrasting management systems over 5 years," *Global Change Biology*, 13, No. 8 (August 2007).

[42] Predrag Rajsic and Alfons Weersink, "Do Farmers Waste Fertilizer?: A Comparison of Ex Post Optimal Nitrogen Rates and Ex Ante Recommended Rates by Model, Site and Year," *Agricultural Systems*, 97, No. 1-2 (2008).

[43] Environmental Commissioner of Ontario, *Annual Report 2010/2011 – Engaging Solutions* (Toronto, Ontario: 2011), 48.

[44] Ontario Ministry of Agriculture, Food and Rural Affairs, information provided to the ECO in response to ECO enquiry, August 16, 2012.

[45] Ontario Ministry of Agriculture, Food and Rural Affairs, information provided to the ECO in response to ECO enquiry, August 16, 2012.

[46] Ontario Ministry of Agriculture, Food and Rural Affairs, information provided to the ECO in response to ECO enquiry, August 16, 2012.

[47] Agri-Energy Producers' Association of Ontario, *Briefing Note – Biogas Potential in Ontario* (January 2011).

[48] The other two categories are: wastewater handling (domestic and industrial); and waste incineration (municipal solid waste and sewage sludge incineration).

[49] Environmental Commissioner of Ontario, *Annual Greenhouse Gas Progress Report 2011: Meeting Responsibilities: Creating Opportunities* (Toronto, Ontario: 2011), 53.

[50] Meeting notes with Ministry of the Environment and ECO staff, June 17, 2012.

[51] Environmental Commissioner of Ontario, *Annual Greenhouse Gas Progress Report 2011: Meeting Responsibilities: Creating Opportunities* (Toronto, Ontario: 2011), 59.

[52] Environmental Commissioner of Ontario, *Annual Greenhouse Gas Progress Report 2011: Meeting Responsibilities: Creating Opportunities* (Toronto, Ontario: 2011), 43.

[53] Plug' n Drive Ontario. 2012: Year of the Electric Car, Globe and Mail Supplement, February 18, 2012, EC7. The emissions associated with charging an EV depend, however, on the time of charging. If done during peak hours, when natural gas-fired generation provides the marginal power supply, the emissions would be higher than if the vehicle is charged during off-peak hours.

[54] Pollution Probe, *Unlocking the Electric Mobility Potential of Toronto: Moving Toward an Electric Mobility Master Plan for the City* (October 2010).

[55] Canadian Manufacturers and Exporters, *Advancing Opportunities in Energy Management in Ontario Industrial and Manufacturing Sector* (March 2010), iii.

[56] Roger Sathre and Jennifer O'Connor, *A Synthesis of Research on Wood Products and Greenhouse Gas Impacts*, 2nd Edition, Technical Report No. TR-19R (October 2010).

[57] For a more detailed discussion of district heating and combined heat and power systems, refer to the ECO's forthcoming Annual Energy Conservation Progress Report – 2011 (Volume Two).

[58] Government of Ontario, *Annual Report 2009–2010. Climate Progress: Ontario's Plan for a Cleaner, More Sustainable Future*, 37.

[59] Government of Ontario, *Annual Report 2009–2010. Climate Progress: Ontario's Plan for a Cleaner, More Sustainable Future*, 39.

[60] Commission on the Reform of Ontario's *Public Services, Public Services for Ontarians: A Path to Sustainability and Excellence* (2012), 140.

[61] Commission on the Reform of Ontario's *Public Services, Public Services for Ontarians: A Path to Sustainability and Excellence* (2012), 140.

[62] Rausch S., and Reilly J. (2012). *Carbon Tax Revenue and the Budget Deficit: A Win-Win-Win Solution?* Report 228. MIT Joint Program on the Science and Policy of Global Change.

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