Ontario's Climate Act From Plan to Progress

Annual Greenhouse Gas Progress Report 2017



Extreme events around the world in 2017 demonstrate the effects of climate change

Wildfires



Hurricanes

Floods







Ice shelf collapse





Droughts

Coral die-off

Photo sources: NASA; f00sion; Roosevelt Skerrit; Davidtalukdar; Pierre Markuse; UK Department for International Development; Rainer von Brandis.

Environmental Commissioner of Ontario

January 2018

The Honourable Dave Levac Speaker of the Legislative Assembly of Ontario

Room 180, Legislative Building Legislative Assembly of Ontario Queen's Park Province of Ontario



Dear Speaker:

In accordance with Section 58.2 of the *Environmental Bill of Rights, 1993 (EBR)*, I am pleased to present the 2017 Greenhouse Gas Progress Report of the Environmental Commissioner of Ontario for your submission to the Legislative Assembly of Ontario. This report is my independent, non-partisan review of the Ontario government's progress in reducing greenhouse gas (GHG) emissions for 2016-2017.

In summary, **Ontario can be proud of its significant progress in the last year on climate change policy, and on reducing Ontario's GHG emissions.** According to the latest available data, Ontario's GHG emissions have dropped to the lowest level since reporting began in 1990, while gross domestic product and population continued to grow. Further reductions can be expected as Ontario's cap and trade program and other climaterelated policy initiatives work their way through the economy.

After a decade of talking about putting a price on GHG pollution, Ontario finally did it, and the first year went well. The cap and trade program is complicated and has room for improvement. But it has put Ontario on the right track.

Sincerely, Dianne Saxe

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It's complicated, but Ontario is on the right track

How are our emissions?

This is my second report to the Ontario Legislature about greenhouse gases (GHGs) and climate change.

In 2018, it is much too late to just *talk* about the climate; what counts now is action. Ontario took an essential first step when it closed its coal-fired power plants – still Canada's largest GHG reduction, and a help to air quality.

This report examines Ontario's progress on the second major step, putting a price on GHGs emitted into the atmosphere, for the benefit of our environment, our economy and our health.

Dianne Saxe, Environmental Commissioner of Ontario

Chapter 1: Ontario's GHG Emissions are Down

According to the latest available data, Ontario's GHG emissions dropped to the lowest level since reporting began in 1990, while gross domestic product and population continued to grow.

Moving in the right direction

Mild weather, energy conservation/efficiencies, and coal-free electricity all helped reduce our emissions, but transportation emissions (especially from trucking – see Chapter 6) keep increasing.



Ontario's GHG emissions relative to GDP and population.

Source: Statistics Canada, *Gross domestic product, expenditure-based, provincial and territorial* (2016), CANSIM Table 384-0038; Statistics Canada, *Population by year, by province and territory* (2016), CANSIM Table 051-0001.



What has happened since the release of the *Climate Change Action Plan?*

Chapter 2: Policies and Programs Since the Action Plan

A lot, actually

This has been a busy time for Ontario climate policy. Since the government released its *Climate Change Action Plan* in June 2016, it has introduced dozens of additional policies and programs to reduce emissions from buildings, waste, transportation, land use, etc.

The central pillar was to put a cap and a price on Ontario's GHG emissions through a new carbon market (cap and trade program) that began January 1, 2017. Because long-term predictability of carbon policy is so important, Ontario has announced its cap on future GHG emissions for every year until 2030.



Ontario's emissions-reduction targets, cap on allowances for capped emitters, and estimate for non-capped sectors.

Source: Environmental Commissioner of Ontario.

The first year's distribution of carbon allowances (permits to emit GHGs) went smoothly, and the first four quarterly allowance auctions raised \$1.9 billion for the Greenhouse Gas Reduction Account (see Chapter 5).



Cap and trade is getting better and more popular around the world. The link with California and Quebec should help Ontarians

Chapter 3: National and International Context for Ontario's Climate Policy

Ontario has joined other jurisdictions around the world that are producing economic, health and environmental gains by putting a price on carbon pollution.



Carbon pricing initiatives around the world. China also now has a national cap and trade program.

Source: International Emissions Trading Association Global Carbon Pricing Map (December 2017).



Most jurisdictions have chosen cap and trade instead of a carbon tax, although both options can work. Cap and trade can be hard for many people to trust because it is hard to understand. But research from Harvard and elsewhere shows that cap and trade can reduce emissions more reliably and at less cost than a carbon tax.

In Canada, the *Pan-Canadian Framework on Clean Growth and Climate Change* requires all provinces and territories to put a price on carbon. Ontario can use its cap and trade program instead of the higher-cost federal carbon tax.



Carbon price forecasts under carbon tax and cap and trade policies.

Source: Environmental Commissioner of Ontario with cap and trade price estimate from ICF, Long-Term Carbon Price Forecast Report (July 2017).

Ontario's carbon market is now linked with California and Quebec, its Western Climate Initiative (WCI) partners. This should keep the cost of gasoline and diesel lower for Ontarians; stabilize Ontario's carbon market; and help Ontario industries invest in emissions reductions here at home. However, the United States' decision to pull out of the Paris Agreement complicates Ontario's plans to count emissions reductions in California as our own, and political uncertainty could weaken the next two WCI auctions. GHG emissions have dropped faster than expected in all three WCI partner jurisdictions. This good news means that:

- The WCI market needs fine-tuning to reduce the oversupply of allowances;
- Carbon allowance prices are likely to stay low until well after 2020; and
- The predicted (temporary) flow of money from Ontario to California may shrink.



Chapter 4: Carbon Offsets

Offset credits offer a second key tool to reduce emissions while keeping the cost down for Ontarians.

About 18% of Ontario's GHG emissions (such as methane and nitrous oxide from waste, agriculture and forestry) are not covered by the cap and trade program. Offset credits could allow capped emitters to pay these uncapped sectors to reduce their emissions, or to take CO_2 out of the atmosphere, flowing money to rural communities.





How Offsets Work in the Cap and Trade Market

Offset credits could keep the cost of emissions reductions down for capped emitters. This is particularly important for petroleum product suppliers, who pay most of the cost of cap and trade, and who will pass it on to drivers.

Source: Environmental Commissioner of Ontario.



How Cap and Trade Works for a Fuel Distributor

Graphic not to scale, used for illustrative purposes only

Source: Environmental Commissioner of Ontario.



But if offsets are not done right, they can be little more than greenwashing. Some of Ontario's proposed protocols should be rejected.



The ECO's rating of Ontario's proposed offset protocols.

Proposed Offset Protocol	Rating and Recommendation			
	Move Forward			
	Proceed With Caution			
	Do Not Move Forward			
	? Not Enough Known			
Landfill gas capture and destruction				
Mine methane capture and destruction	•			
Ozone depleting substances capture and destruction				
Refrigeration systems				
Conservation cropping				
Nitrous oxide reductions from fertilizer management in agriculture				
Emissions reductions from livestock	?			
Grassland projects				
Anaerobic digestion				
Organic waste management				
Forest management				
Afforestation and reforestation				
Urban forest projects				

Chapter 5: Greenhouse Gas Reduction Account

How well is the provincial government using the \$1.9 billion dollars that flowed into the Greenhouse Gas Reduction Account (GGRA) from the first four cap and trade auctions?

According to the *Climate Change Mitigation and Lowcarbon Economy Act, 2016 (Climate Act)*, GGRA funds must be used to reduce, or support the reduction of, GHG emissions. The ECO examined all uses of GGRA funds announced as of November 2017. Ninety-nine percent of these funds went to initiatives that met the minimum requirements of the *Climate Act*.

Government use of the GGRA is improving. By next year, the ECO wants to see a coherent plan tying GGRA funding decisions to the emissions-reduction targets in the *Climate Act* and to the reduction responsibilities of each ministry. For now, the GGRA's most important benefit is the improvement it has triggered in understanding Ontario's opportunities to reduce emissions.



The growth of heavy truck GHG emissions has been driven by increased demand.

Source: Natural Resources Canada, Comprehensive Energy Use Database (2016), Transportation Sector, Ontario, Table 36: Medium and Heavy Truck Secondary Energy Use and GHG Emissions by Energy Source.

Some Ontario government policies, such as subsidies for natural gas trucking, are not likely to reduce emissions. Instead, the government should encourage the freight sector to *avoid* trucking where possible (e.g., through logistics and road pricing), *improve* diesel truck efficiency (e.g., through incenting the scrapping of older diesel trucks), and *shift* freight away from fossil fuels (e.g., providing more targeted support for zero-emission trucks). Is the government getting serious about climate change?

> Yes - but there is still a long way to go

Chapter 7: Is the Ontario Government Taking Climate Change Seriously?

Some Ontario government ministries are taking climate change seriously. Progress this year included consideration of climate change in the *Long-Term Infrastructure Plan*, improvements to the Building Code, and empowering municipalities to adopt climate change by-laws.

But ministries often fail to treat climate change as the crisis that it is. For example, the government has a blind spot for many of its own emissions, funds projects that worsen urban sprawl, and adopted a *Long-Term Energy Plan* that will not take Ontario to its climate targets. And Ontario's fiscal policy continues to undermine its climate policy, e.g., through fossil fuel subsidies.



Chapter 8: Low-Carbon Procurement

Government procurement is an important tool to build Ontario's low-carbon economy. The Ontario government buys, on average, more than \$10 billion dollars of goods, services and infrastructure every year, and is a critical early market for low-carbon innovations. The Ontario government has made some efforts to green what it buys and builds, but does not yet:

- 1. insist on knowing the GHG footprint of what it buys;
- 2. give that GHG footprint significant weight in procurement decisions;
- 3. set an emissions-reduction target for what it buys; or
- 4. report on its progress.



Chapter 9: Climate Change Impacts in Ontario

Climate change isn't just about polar bears, or about other people in other places in the future. Ontario is already feeling the effects of climate change, and much more is ahead.

Higher average temperatures and more extreme events, such as drought, storms, flooding and fires, are affecting people and organizations across the province. Tourism, forestry, agriculture and infrastructure are among the sectors affected by warmer, wilder and more unpredictable weather. Flooding continues to devastate families and communities in many parts of Ontario. Windsor had two "floods of the century" within 12 months.





Flooding in Harriston, Ontario. Photo credit: Emergency Management Ontario.

Public health is at risk from the spread of ticks, wildfire smoke and hotter weather, which also intensifies the impacts of air pollution. Ontario air quality is degraded even by distant events, such as fires in western Canada and the United States.



Chapter 10: Talking With Ontarians About Climate Change

The Environmental Commissioner and her staff spend a lot of time talking with Ontarians about the urgency of climate change, what each of us can do about it, and what we owe to the young people we care about.



Young people won't have what we had.

Climate change mitigation and adaptation cannot be left entirely up to government. No one can do everything, but everyone can do something. Ontarians must reduce their carbon footprint, get ready to adapt and speak up. It's not too late to make a difference.



January 2018

Dear Friends,

I am proud to deliver this, my second climate change report on GHG emissions to the Ontario Legislature.

Since the ECO's 2016 Greenhouse Gas Progress Report, *Facing Climate Change*, I have travelled Ontario talking with Ontarians about climate change, what each of us can do about it, and what we owe to the young people we care about.¹ Meanwhile, news from climate scientists has become steadily more dire. Hurricanes, floods and forest fires around the world caused enormous devastation, economic damage, and human and environmental disruption. Some of these events are illustrated on the inside front cover of this report. Today's toddlers could experience a staggering 2.4 metre sea level rise during their lifetimes. It is therefore much too late to just talk about the climate; all that really counts now is action



Urgent Climate Crisis

Based on what I learned at the 23rd Conference of the Parties to the United Nations Framework Convention on Climate Change (COP 23), one memorable way to summarize the enormity of the climate crisis is:

- Three years: In as few as three more years, today's emission levels could lock us into a future of more than 1.5 degrees Celsius (°C) of warming above preindustrial levels.² In other words, the remaining capacity of the world's atmosphere, land and oceans to absorb greenhouse gases, without eventually pushing the global average temperature more than 1.5°C might be used up in just three more years.
- Three degrees: Emissions will not magically stop in three years. Instead, the world is on track to experience about 3°C of warming this century, even if every country fulfils its Paris Agreement commitments.³ The consequences would be enormous. And it is rather heroic to assume that every country will completely fulfil those promises. Today, no country in the world, including Canada, is on track to do so. The United States government has decided to withdraw from the Paris Agreement entirely. Within the OECD, Canada is the second most carbon-intensive country (after Estonia) and the fourth-biggest emitter of greenhouse gases. Rising emissions from transport and oil production mean that overall, Canada's emissions have declined by just 1.5% since 2000, despite Ontario's emissions dropping by more than 20%, and compared to an average decrease of 4.7% across the OECD area.4
- Three metres: So much warming has already occurred that the melting of the West Antarctic Ice Sheet may have passed the point of no return. No one knows how long it will take for the entire ice sheet to melt, but once it does, this ice alone may raise average global sea levels by about three metres. Meanwhile, credible estimates of sea level rise by 2100 are becoming increasingly dire. The IPCC's 2014 estimates, forecasting an average of 0.8 metres of global sea level rise by 2100, are now out of date. Current research forecasts we are on track for an average of 1.5 metres of sea level rise this century, i.e., within the lifetime of today's toddlers.⁵ Without protective measures, this amount of sea level rise would submerge land currently home to 153 million people. And it is now plausible that today's toddlers could experience a staggering 2.4 metre sea level rise during their lifetimes.⁶ This, plus the storm surges that already put millions of people at risk of catastrophic floods,7 would inundate coastal cities, ports and nuclear plants around the globe.

It is therefore much too late to just *talk* about the climate; all that really counts now is action. Ontario has both a role and responsibility to reduce our emissions, due to our high per capita emissions, past and present; our wealthy economy; our immense resources; our relative safety from climate-related risks, and our opportunities to build a low-carbon economy. Ontario took an essential first step by closing its coal plants – still Canada's largest GHG reduction, and a help to air quality. Today I report on Ontario's progress in implementing the second major step, for the environment, for our economy and for our health. As planned, the first cap and trade compliance period began on January 1, 2017, meaning that 2017 was the first year that Ontario put a clear price on GHG emissions into the atmosphere (sometimes called *carbon pollution*).

Chapter 1 starts with the numbers. In 2015, Ontario's GHG emissions continued to drop, partly because of ongoing energy efficiency programs⁸ and a mild winter. Looking ahead, the *Climate Change Action Plan* may take time to produce noticeable results, but other factors will help to reduce emissions, including:

- direct citizen action;
- warmer winters;
- continuing drops in the cost of renewable energy and increasing utility sophistication in using it;
- improvements in, and greater adoption of, electric vehicles and other technologies;
- action by municipalities, who now have the power to adopt by-laws dealing with climate change, and who manage most of Ontario's infrastructure including roads, transit, water, wastewater and waste;
- significant investments by all levels of government in transit and active transportation;
- climate-related litigation;

- corporate awareness of, and interest, in climaterelated risks and opportunities, driven in part by the guidelines issued by the global Financial Stability Board's Task Force on Climate-related Financial Disclosures;
- financial institution, investor and supply-chain scrutiny of such risks and opportunities; and
- possibly, the price of allowances.

Chapters 2 to 8 reports on what the provincial government did in the last year to move Ontario towards a lower-GHG emission economy. I focus on three main questions:

- 1. How is the cap and trade system working? *First year went smoothly.*
- 2. How are the revenues being used? Mostly in accordance with the Climate Act, but not to the best effect.
- 3. Is the government aligning the rest of its financial and regulatory powers to support the low-carbon transition? It's starting, but there is a long way to go.

Chapter 9 briefly summarizes how climate change is already affecting Ontario, and Chapter 10 summarizes

my conversations with Ontarians about climate change.

THE FIRST YEAR OF CAP AND TRADE WENT REMARKABLY WELL



The First Year of Cap and Trade

In general, the first year of cap and trade went remarkably well, though I was not surprised to find many details that still need work. Cap and trade can cut the economic costs of reducing Ontario's GHG emissions and provide a degree of certainty about future reductions,⁹ but it is undeniably complicated.

Ontario began the first compliance period in its cap and trade system on January 1, 2017. The first year's four auctions were rousing successes, selling out almost all current year vintages and most of the future year vintages, largely at prices above the legal minimum (floor price). In total, the auctions raised more than \$1.9 billion for the Greenhouse Gas Reduction Account (GGRA), without causing undue hardships among fossil fuel consumers. On balance, the system design that Ontario chose compares well to others elsewhere, and has most of the features recommended by the Harvard University Project on Climate Agreements.¹⁰

Few of the concerns raised beforehand have come to pass. The auctions have run smoothly, with a growing number of participants. The ECO is aware of no credible claims of fraud or other improper behaviour, either in the distribution of free allowances or in the auctions. Competitiveness concerns for Ontario's Energy-Intensive, Trade-Exposed industries were addressed with high levels of free allowances for roughly one hundred large facilities, the so-called Large Final Emitters who generate about a fifth of Ontario's GHGs. Around 80 smaller facilities *opted in* to get the same treatment, receiving more than 90% of their allowances for free in exchange for individual GHG compliance obligations. Concerns about longer-term predictability have been partly resolved by announcing the intended caps for every year until 2030.

Meanwhile, the cap and trade system is starting to motivate change, offsetting some of the hundreds of millions of dollars of provincial subsidies for fossil fuels.¹¹ Making all of us pay something for our GHG pollution raises the profile and the financial attractiveness of avoiding, shifting and improving how we use fossil fuels. For example, natural gas distributors went back to the Ontario Energy Board for permission to pay and charge customers a little extra for *green gas*, i.e., renewable natural gas made from organic materials. The ECO's own landlord, which manages 25 million square feet of commercial and other real estate across Canada, has launched a sustainability initiative to cut its fossil fuel use.

Linked Carbon Markets

Ontario has formally linked its carbon market with its Western Climate Initiative (WCI) partners, California and Quebec; the first joint allowance auction is to take place on February 21, 2018. The link has advantages and disadvantages for Ontario, which the ECO reviewed in depth in our 2016 Greenhouse Gas Progress Report. We have updated that material in Chapter 3, considering some major national, U.S. and international developments since November 2016.

One advantage we did not explore last year is that Ontario emitters can use the linked secondary carbon market to raise capital to update their equipment. Ontario's initial four-year compliance period, with no annual true-ups (where capped emitters submit the

ONTARIO EMITTERS CAN USE THE LINKED SECONDARY CARBON MARKET TO RAISE CAPITAL TO UPDATE THEIR EQUIPMENT

required emissions allowances and credits to the Ontario government), allow energy-intensive industries to hold large numbers of free allowances for up to nearly five years. This turns out to offer large Ontario emitters a long window to trade or borrow against those free allowances to raise funds to buy the loweremission equipment they need to cut their emissions. This is especially important for those energy-intensive industries whose Ontario plants are comparatively old, such as many of the Sarnia facilities whose toxic pollution we described in Chapter 3 of the ECO's 2017 Environmental Protection Report, *Good Choices, Bad Choices*.

Carbon Offsets

One shortcoming of Ontario's current climate policy is the lack of clarity on how to reduce the 18% of Ontario's GHG emissions that are not covered by cap and trade. For the most part, these are non-fossil fuel emissions from agriculture, forestry and waste.

THERE IS A LACK OF CLARITY ON HOW TO REDUCE THE 18% OF ONTARIO'S GHG EMISSIONS THAT ARE NOT COVERED BY CAP AND TRADE

The province plans to provide financial incentives for emissions reductions in these sectors, in Ontario and elsewhere in Canada, by allowing them to create and sell offset credits to capped emitters, i.e., Ontario entities who must comply with cap and trade. Under the *Climate Act* and regulations, capped emitters may use offsets for up to 8% of their compliance obligation.

Ontario's offset system is just starting to take shape, with the release of its *Ontario Offset Credits* regulation¹² and draft first offset protocol, which sets out rules and criteria for recognizing offsets from landfill gas. Other protocols are expected in 2018.

Carbon offsets are potentially powerful tools that might offer cost-effective emissions reductions. In essence, offset credits allow capped emitters (directly and indirectly, everyone in Ontario who uses fossil fuels) to avoid decreasing their own emissions by paying for matching decreases in sectors outside the cap. If uncapped sectors have inexpensive reduction opportunities, offsets could produce economic and environmental co-benefits both in rural areas and to Ontario's capped emitters. However, these benefits are justified only if offset credits deliver GHG reductions that are real, additional, permanent and verifiable.

Under the WCI Linking Agreement, Ontario emitters can already use offset credits registered in California or Quebec for compliance purposes in Ontario. Ontario's agriculture, forestry and waste industries are understandably anxious to be able to generate and sell credits of their own and there are obvious advantages to retaining offset funds within Ontario. However, offsets are a prominent example of the adage, *the devil is in the details*.

This ECO report argues that several of the offset protocols that have been accepted by our WCI partners are not based on adequate evidence and may not



provide real, additional, permanent and verifiable emissions reductions. I urge the province of Ontario not to repeat the same mistakes and insist its own offset credits be of high quality, no matter what our partners are doing. I also urge Ontario to exercise its rights under the Linking Agreement to encourage our WCI partners to improve the stringency of their own offset protocols.

Using the Money Well?

So far, Ontario has been spending its cap and trade proceeds, through the GGRA, to implement its *Climate Change Action Plan*. Last year, we reported on key strengths and weaknesses of that Action Plan, including the government's intent to improperly use large parts of the auction revenues to subsidize electricity rates. Fortunately, the government changed course and eventually acknowledged that it can only use cap and trade auction proceeds to reduce, or support the reduction, of GHG emissions.

As shown in Chapter 5, 99% of the \$1.4 billion allocated through the GGRA was in accordance with the requirements of the *Climate Act*. Most were focused on lowering the costs of reducing fossil fuel consumption. Such initiatives will help many Ontarians to cope with the (so far modest) impact of the cap and trade system on fuel prices, but they are not likely to create *additional* GHG reductions for Ontario beyond what would already be achieved with cap and trade.¹³

99% OF THE \$1.4 BILLION ALLOCATED THROUGH THE GGRA WAS USED IN ACCORDANCE WITH THE REQUIREMENTS OF THE *CLIMATE ACT* Much better options are available for the money, including greater support for clean technology and for emissions reductions in non-capped sectors in Ontario. Reducing other taxes and/or sending Ontarians a *carbon dividend* would also have many advantages, but might not meet constitutional law requirements.¹⁴

THE PROVINCE DOES NOT YET CLEARLY TIE WHAT IT SPENDS FROM THE GGRA TO THE CLIMATE GOALS IT NEEDS TO ACHIEVE



Part of the problem is that the province does not yet clearly tie what it spends from the GGRA to the climate goals it needs to achieve. When the first \$325 million was promised in 2015, ministries were just learning what they could do with the money, and how to forecast what the money could achieve. By 2017, their internal processes were improving, but no one is accountable for real results. For example, no ministry is accountable for achieving any specific amount of reductions either in their own operations or among their client groups. No one is accountable for the cost effectiveness of GGRA-funded projects. And no one is accountable to link the total cap and trade proceeds to any specific level of economy-wide GHGs, not even to the 9.8 Mt promised in the Action Plan.

This needs to change.



Freight Trucks

The lack of such accountability may help to explain our findings in Chapter 6.

Freight transported by truck is the fastest growing source of Ontario GHG emissions. In fact, while overall GHG emissions have dropped since 1990, freight emissions have doubled. It will not be possible for Ontario to achieve its *Climate Act* targets without dramatic cuts in GHG emissions from freight.

Chapter 6 therefore looks closely at government initiatives that focus on freight. I am encouraged to see that the provincial government recognizes the consequences and importance of emissions from freight. Unfortunately, the ECO finds that some of the initiatives the government has chosen are not likely to materially reduce GHG emissions. In fact, subsidizing fossil natural gas trucking will actually accelerate climate change by increasing methane emissions. The government has chosen some ideas that are popular with stakeholders, instead of those that are likely to be most effective.

What About the Rest of Government?

The \$1.9 billion raised to date by cap and trade is important, but small (less than 2%) in comparison to the annual provincial budget of ~\$140 billion. And what the province spends through its budget is, in turn, a comparatively small part of the overall power that the provincial government exercises over Ontario's emissions. The comparatively small impacts of cap and trade, and the *Climate Change Action Plan*, can easily be swamped by other government actions, including land-use planning and government procurement, among a huge range of its regulatory, taxation, and financial powers. For example, the Ministry of Energy by itself governs 70% of Ontario's emissions, yet its 2017 ONE OF THE MOST IMPORTANT CONTRIBUTIONS OF THE CAP AND TRADE SYSTEM MAY BE THE INCREASED CLIMATE AWARENESS IT CREATES WITHIN GOVERNMENT MINISTRIES

Long-Term Energy Plan does little to achieve Ontario's climate targets.¹⁵

Accordingly, one of the most important contributions of the cap and trade system may be the increased climate awareness it creates within government ministries. Competition between ministries for access to cap and trade proceeds has done wonders, bolstered by the ECO's climate science presentations at the senior management tables of all key ministries. There could also be benefits from universally including climate change considerations in ministries' Statements of Environmental Values, as some ministries have begun to do.¹⁶

Policies and Programs

Chapter 2 describes an impressive range of climaterelated policy initiatives across the Ontario government since the adoption of the *Climate Change Action Plan*. In addition, numerous initiatives have been allocated funds from the cap and trade auction proceeds (see Chapter 5).

Climate Lens - The Survey

To assess ministries' awareness of climate urgency, the impact of their actions on Ontario's carbon footprint, and the opportunities to do better throughout their mandates, the ECO undertook a survey of all relevant ministries. We intend to repeat and refine this survey



THERE HAS BEEN AN IMPRESSIVE RANGE OF CLIMATE-RELATED POLICY INITIATIVES ACROSS THE ONTARIO GOVERNMENT



annually. Chapter 7 describes the rather general answers received. In the future, I expect to both ask better questions and get better answers.

Estimating the GHGs from the Ontario Public Service and Broader Public Sector

We were surprised to see how much the government currently underreports its GHGs, only accounting for emissions from energy use in its vehicles, buildings, and employee air travel. Chapter 7 provides a more complete estimate of the GHGs from the Ontario public service and broader public sector. Overall, more than half of the government's GHGs are left unreported. It should take these emissions into account in its own GHG-reduction target.

Procurement

Chapter 8 examines how the Ontario government uses its immense procurement power to further its climate goals. Here again we found several good initiatives, but incomplete accounting and much that could be done better.

AFTER A DECADE OF TALKING ABOUT PUTTING A PRICE ON CARBON POLLUTION, ONTARIO FINALLY DID IT

Conclusion

Since the Paris Agreement in December 2015, the international community has finally moved on from *whether* to reduce GHGs to *how*. Ontario has made the same transition *From Plan to Progress*. The first year of the cap and trade program was a success and future emission caps were set up to meet Ontario's aggressive targets.

The government needs to continue to improve its climate policies, especially on:

- working with WCI partners to address oversupply of allowances and ensure offset credits are real;
- 2. getting more bang for each GGRA (cap and trade revenue) buck, particularly in the challenging freight sector; and
- 3. making sure that climate change is a central part of all government decision making, spending and regulating.

I am tough on the details because climate change is urgent and it takes time to see the results of our efforts. Still, after a decade of talking about putting a price on carbon pollution, Ontario finally did it. That is an achievement worth celebrating. Kudos to everyone, particularly the hard-working team at the Ministry of the Environment and Climate Change, who made it happen. And though they may not agree on the details, kudos to all of Ontario's official parties for supporting carbon pricing.

Sincerely,

are

Dianne Saxe, Environmental Commissioner of Ontario





- 1. "Facing Climate Change webinar," online: Environmental Commissioner of Ontario <<u>eco.on.ca/reports/2016-facing-climate-change/</u>>
- 2. Three years as of January 2018 for 66% chance of remaining below a temperature increase of 1.5°C.

"Carbon Countdown," online: Carbon Brief <<u>www.carbonbrief.org/</u> analysis-four-years-left-one-point-fivecarbon-budget>

This is based on a simplified calculation analyzing CO_2 emissions only, but actual warming is based on CO_2 concentrations (which depends on the changing rates of CO_2 emissions and absorption over time), in addition to non- CO_2 climate drivers (e.g., methane and aerosol forcing).

One recently published study describes a complex "climate-carboncycle" model that suggests "limiting warming to 1.5°C is not yet a geophysical impossibility, but is likely to require delivery on strengthened pledges for 2030 followed by challengingly deep and rapid mitigation. Strengthening near-term emissions reductions would hedge against a high climate response or subsequent reduction rates proving economically, technically or politically unfeasible."

R Millar et al., "Emission budgets and pathways consistent with limiting warming to 1.5° C" Nature Geoscience, 10 (2017) 741 at 741.

- 3. United Nations, News Release, UN Climate Change Conference 2017 Aims for Further, Faster Ambition Together, (November 5, 2017)
- Organization for Economic Co-operation and Development, News Release, Canada needs to speed up efforts to green its energy and transport sectors, (December 19, 2017)
- Kopp, R. E., DeConto, R. M., Bader, D. A., Hay, C. C., Horton, R. M., Kulp, S., Oppenheimer, M., Pollard, D. and Strauss, B. H. (2017), Evolving Understanding of Antarctic Ice-Sheet Physics and Ambiguity in Probabilistic Sea-Level Projections. Earth's Future. doi:10.1002/2017EF000663.
- USGCRP, 2017: Climate Science Special Report: Fourth National Climate Assessment, Volume I [Wuebbles, D.J., D.W. Fahey, K.A. Hibbard, D.J. Dokken, B.C. Stewart, and T.K. Maycock (eds.)]. U.S. Global Change Research Program, Washington, DC, USA, 470 pp., doi: 10.7930/ J0J964J6.
- "Tropical cyclones: the main risk driver," online: Swiss Re <media. swissre.com/images/stormsurge_publication_A4_infographic.png>
- Environmental Commissioner of Ontario, *Every Joule Counts*, Annual Energy Conservation Progress Report 2016/2017, vol 2 (Toronto: ECO, August 2017).

- 9. Richard Schmalensee and Robert N. Stavins, *Lessons Learned from Cap and Trade Experience* (Washington: Resources for the Future, 2017)
- 10. Joseph E. Aldy, *The Political Economy of Carbon Pricing Policy Design*, (Boston: Harvard University, 2017) at 16.
- Environmental Commissioner of Ontario, "Fossil Fuel Subsidies" in *Let's Get Serious*, Annual Energy Conservation Progress Report 2015/2016 (Toronto: ECO, May 2016) at 137.
- 12. Ontario Offset Credits, O Reg 539/17.
- Richard Schmalensee and Robert N. Stavins, Lessons Learned from Cap and Trade Experience (Washington: Resources for the Future, 2017)
- Environmental Commissioner of Ontario, "Spending the Money Well" in Facing Climate Change, Annual Greenhouse Gas Progress Report 2016 (Toronto: ECO, November 2016) at 88.
- 15. Environmental Commissioner of Ontario, *Developing the 2017 Long-Term Energy Plan, 2016 Special Report* (Toronto: ECO, December 2016).
- Environmental Commissioner of Ontario, "The Environmental Bill of Rights" in *Good Choices, Bad Choices*, Annual Environmental Protection Report 2017 (Toronto: ECO, October 2017).



Chapter 1 Ontario's Emissions in 2015



Abstract

This chapter describes Ontario's most up-to-date greenhouse gas emissions data and how they are changing within each economic sector.

Ontario's greenhouse gas emissions in 2015 were the lowest since reporting began in 1990. This continues the recent downward trend in emissions that allowed Ontario to meet its 2014 emissions-reduction target of 6% below 1990 levels. However, this past success was largely a result of closing Ontario's coal power plants. 2015 was the first year coal was not used to generate any of Ontario's electricity. Thus, new initiatives are needed if Ontario is to meet its future emissions-reduction targets of 15% in 2020, 37% in 2030 and 80% in 2050.

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1.0 Greenhouse Gas Emissions at Their Lowest

Ontario's greenhouse gas (GHG) emissions are the lowest since reporting began in 1990.¹ Emissions in 2015 were 8.3% below those in 1990, as shown in Figure 1.1. The previous reported low was 7.9% below 1990 levels in 2009 during an economic recession.²

ONTARIO'S GREENHOUSE GAS EMISSIONS ARE THE LOWEST SINCE REPORTING BEGAN



Figure 1.1. Ontario's historical GHG emissions and emissions-reduction targets.

Source: Environment and Climate Change Canada, National Inventory Report 1990-2015: Greenhouse Gas Sources and Sinks in Canada (2017), Part 3, Table A11-12, page 58.

Ontario has three GHG emissions-reduction targets that are based on 1990 levels. The province achieved its first target of a 6% reduction by 2014 (Figure 1.1). This success was largely a result of the phase-out of coal for electricity generation, which was completed in 2014. This allowed the post-recession downward trend that began in 2010 to continue into 2015 – even with the economic and population growth shown in Figure 1.2.

THE PHASE-OUT OF COAL ALLOWED THE POST-RECESSION DOWNWARD TREND THAT BEGAN IN 2010 TO CONTINUE INTO 2015







Source: Statistics Canada, Gross domestic product, expenditure-based, provincial and territorial (2016), CANSIM Table 384-0038; Statistics Canada, Population by year, by province and territory (2016), CANSIM Table 051-0001.

Ontario's ability to reduce electricity sector GHG emissions has been nearly exhausted, as shown in Figure 1.3. Non-electricity GHG emissions were 3% higher in 2015 than in 1990. Thus, non-electricity GHG emissions must start to fall in order for Ontario to meet its increasingly stringent future targets of a 15% reduction by 2020, 37% reduction by 2030 and an 80% reduction by 2050. These targets and the initiatives the government has proposed to pursue them can be found in Ontario's *Climate Change Action Plan 2016-2020*.



Figure 1.3. Ontario's historical GHG emissions by economic sector relative to 1990 levels.

Source: Environment and Climate Change Canada, National Inventory Report 1990-2015: Greenhouse Gas Sources and Sinks in Canada (2017), Part 3, Table A11-12, page 58.

1.1 Which Greenhouse Gases Are Produced?

Carbon dioxide represented 84% of Ontario's reported 2015 GHG emissions, as illustrated in Figure 1.4. Another 9% were from methane, 5% from nitrous

oxide, and 2% from synthetic gases. However, as first discussed in Chapter 3 of our *2016 Greenhouse Gas Progress Report* (which can be found on our website

along with our other past reports cited here), and further examined below, Ontario's official emissions from the *National Inventory Report* underestimate the climate change impact of methane. This means both the contribution from methane and Ontario's total GHG emissions are higher than those reported.



Figure 1.4. Ontario's 2015 GHG emissions by greenhouse gas type. Perfluorocarbons are synthetic gases that are not shown in the figure due to their relatively small quantities.

Source: Environment and Climate Change Canada, National Inventory Report 1990-2015: Greenhouse Gas Sources and Sinks in Canada (2017), Part 3, Table A11-13, page 59. Global warming potentials are weighting factors that allow comparisons between the different types of GHG emissions. Each type of GHG emission is weighted by its ability to absorb heat over a period of time, as compared to carbon dioxide. The *National Inventory Report* uses 100-year global warming potentials from the Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report (AR4) released in 2007. However, the IPCC has since released a Fifth Assessment Report (AR5) in 2014 with updated global warming potentials that are now higher for methane. Additionally, methane is a short-lived climate forcer, which means its global warming potential is even higher when examined over a 20-year time horizon.

The impact on Ontario's GHG emissions of using a higher methane global warming potential is shown in Figure 1.5. All other figures in this chapter are produced using the official GHG emission estimates from the *National Inventory Report*.





Source: Environment and Climate Change Canada, National Inventory Report 1990-2015: Greenhouse Gas Sources and Sinks in Canada (2017), Part 3, Table A11-13, page 58.



The National Inventory Report classifies Ontario's sources of GHG emissions into four IPCC sectors: energy, agriculture, waste, and industrial processes and product use.

Energy use resulted in 76% of Ontario's official 2015 GHG emissions. This was primarily from the burning of fossil fuels for transportation and heating, but also from venting and leakage. These emissions were primarily in the form of carbon dioxide, with methane and nitrous oxide emissions released in much smaller quantities, as shown in Figure 1.6.

Agricultural practices include animal digestion, manure, soil and fertilizer use. These produced 6% of total emissions, mostly in the form of methane and nitrous oxide. *Waste management* produces emissions from decomposition and incineration. These were responsible for 5% of the total emissions and were predominantly methane.

Industrial processes and product use result in emissions from physical and chemical reactions. These emissions were 13% of the total, and mostly carbon dioxide but also include smaller quantities of synthetic gases. Hydrofluorocarbons (e.g., from use as a refrigerant), perfluorocarbons (e.g., from use as a solvent) and sulphur hexafluoride (e.g., from use as an insulating gas) were the synthetic gases emitted.





Source: Environment and Climate Change Canada, National Inventory Report 1990-2015: Greenhouse Gas Sources and Sinks in Canada (2017), Part 3, Table A11-13, page 58.

1.3 Economic Sectors – A More Intuitive Approach

The Government of Canada is required to report GHG emissions in accordance with international guidelines using the IPCC sectors introduced above in Figure 1.6. However, this is not an intuitive approach. Many people may find it easier to understand GHG emissions based on economic sectors. In this approach, one attributes emissions from driving farm tractors to the *agriculture* sector, as opposed to the *energy* sector. Similarly, emissions from a car's air conditioner are attributed to the *transportation* sector rather than to *industrial processes and product use*. Figure 1.7 illustrates Ontario's GHG emissions organized into these more intuitive economic sectors.



Figure 1.7. Ontario's 2015 GHG emissions by economic sector.³

Source: Environment and Climate Change Canada, National Inventory Report 1990-2015: Greenhouse Gas Sources and Sinks in Canada (2017), supplemental data provided to the ECO.

The transportation sector is the largest contributor to Ontario's GHG emissions (33%), followed by industry (29%), buildings (22%), agriculture (7%), waste (5%) and electricity (3%). The emissions from each of these sectors and their subsectors are compared with those in previous years in Table 1.1. Each economic sector is analyzed below using insights and historical data from the *National Inventory Report* unless otherwise specified.

Ontario's Emissions in 2015



1

Table 1.1. Ontario's 1990, 2014 and 2015 GHG emissions by economic subsector.

GHG Emission Sources	Emissions (Mt CO,e)			Change (%)		Share of Total (%)
	1990	2014	2015	1990-2015	2014-2015	2015
Transportation	41	54	55	+34	+1	33
Passenger Transport	31.0	34.7	35.3			
Cars, Light Trucks and Motorcycles	29.0	32.5	33.1			
Bus, Rail and Domestic Aviation	2.0	2.2	2.2			
Freight Transport	8.6	18.6	18.7			
Heavy-Duty Trucks, Rail	7.2	17.0	17.4			
Domestic Aviation and Marine	1.4	1.6	1.2			
Recreational, Commercial and Residential	1.4	0.9	1.0			
Industry	67	50	48	-28	-3	29
Emissions-Intensive and Trade-Exposed Industries	43.2	30.0	29.1			
Iron and Steel	15.0	13.7	12.1			
Chemicals and Fertilizers	16.2	6.8	7.4			
Cement	4.5	4.4	4.5			
Pulp and Paper	3.2	1.8	1.6			
Mining	1.1	1.4	1.5			
Lime and Gypsum	1.7	1.1	1.0			
Smelting and Refining (Non-Ferrous Metals)	1.5	0.7	1.0			
Oil and Gas	10.3	10.8	10.3			
Petroleum Refining	6.6	8.0	7.5			
Oil and Natural Gas Transmission	3.0	2.1	2.1			
Natural Gas Distribution	0.4	0.5	0.5			
Natural Gas Production and Processing	0.3	0.2	0.2			
Conventional Oil Production	0.1	0.0	0.0			
Other	13.2	9.0	8.9			
Light Manufacturing	9.9	6.1	5.7			
Construction	2.9	2.5	2.7			
Forest Resources	0.4	0.4	0.5			
Buildings	28	39	37	+32	-4	22
Residential	18.2	22.3	21.3			
Service Industry	9.6	16.3	15.5			
Agriculture	13	12	12	-3	+1	7
Animal Production	7.4	6.3	6.3			
Crop Production	3.1	3.6	3.3			
On-Farm Fuel Use	2.1	2.6	2.6			
Waste	7	9	9	+16	+1	5
Solid Waste	6.9	7.9	8.0			
Waste Incineration	0.3	0.3	0.3			
Wastewater	0.2	0.3	0.3			
Electricity	26	5	5	-80	+4	3
TOTAL	181	168	166	-8	-1	100

Based on: Environment and Climate Change Canada, National Inventory Report 1990-2015: Greenhouse Gas Sources and Sinks in Canada (2017), Part 3, Table A12-7, page 82.

1.4 Transportation – Ontario's Largest Emissions Source

The reported emissions from the transportation sector in 2015 were 34% higher than 1990 levels. This growth was primarily due to freight vehicles, though on-road passenger vehicles continued to dominate the sector's overall emissions. (Note that the trends shown in Figure 1.8 exclude emissions from international aviation and marine, in accordance with IPCC requirements.)



Figure 1.8. Ontario's GHG emissions from transportation.

Source: Environment and Climate Change Canada, National Inventory Report 1990-2015: Greenhouse Gas Sources and Sinks in Canada (2017), Part 3, Table A12-7, page 82.

There has been rapid growth in both on-road passenger travel and freight activity, as shown in Figure 1.9. Fortunately, the growth in emissions has been moderated by improvements in vehicle fuel efficiency. The improvement has been correlated with increasing fuel prices, as shown in Figure 1.10 for passenger vehicles, while freight vehicles are further examined in Chapter 6. Vehicle fuel efficiency is also regulated by federal policies, but these have been partially undermined by consumer preferences for SUVs and pickup trucks over cars. Additionally, freight truck GHG emissions regulations only began in 2014.

THERE HAS BEEN RAPID GROWTH IN BOTH ON-ROAD PASSENGER TRAVEL AND FREIGHT ACTIVITY





Figure 1.9. Ontario's on-road freight and passenger vehicle activity.

Source: Natural Resources Canada, *Comprehensive Energy Use Database* (2016), Transportation Sector, Ontario, Table 9: Road Transportation Secondary Energy Use and GHG Emissions by Energy Source.



Figure 1.10. Toronto gasoline price and Ontario passenger vehicle energy efficiency.

Source: Statistics Canada, Average retail prices for gasoline and fuel oil, by urban centre (2017), CANSIM Table 326-0009; Natural Resources Canada, Comprehensive Energy Use Database (2016), Transportation Sector, Ontario, Table 10: Passenger Road Transportation Secondary Energy Use and GHG Emissions by Energy Source.

Nearly all (98%) transportation emissions were from vehicle fuel use (shown above in Figure 1.7). Most of the fuel used is ethanol-blended gasoline, as shown in Figure 1.11. Diesel, aviation fuel, propane and natural gas combustion were also used. (Fuel production emissions are excluded from the transportation sector and instead allocated to industry.) GHG emissions from industrial product use in vehicles, namely air conditioner refrigerant, were in the form of hydrofluorocarbons and relatively minor (2%).



Figure 1.11. Ontario's transportation energy use by energy source.

Source: Natural Resources Canada, *Comprehensive Energy Use Database* (2016), Transportation Sector, Ontario, Table 1: Secondary Energy Use by Energy Source.

1.5 Industry – Transitioning to a Low-Carbon Economy

Ontario's industry sector had 28% lower GHG emissions in 2015 than in 1990. This decrease was due to a reduction in *emissions-intensive and tradeexposed*, as shown in Figure 1.12. Emissions from oil and gas, light manufacturing, construction and forest resources have remained relatively consistent.



Figure 1.12. Ontario's GHG emissions from industry.

Source: Environment and Climate Change Canada, National Inventory Report 1990-2015: Greenhouse Gas Sources and Sinks in Canada (2017), Part 3, Table A12-7, page 82.

A closer examination of *emissions-intensive and trade-exposed industries* in Figure 1.13 shows the emissions reductions occurred primarily in the chemical and fertilizer sector. In particular, a single adipic acid plant with high nitrous oxide emissions, which produced 15% of 1990 industry sector emissions, installed emissions-reduction technology in 1997 and shut down in 2009. Emissions from iron and steel have gradually decreased, primarily with dropping production levels.

A SINGLE ADIPIC ACID PLANT WITH HIGH NITROUS OXIDE EMISSIONS, WHICH PRODUCED 15% OF 1990 INDUSTRY SECTOR EMISSIONS, SHUT DOWN IN 2009



Figure 1.13. Ontario's GHG emissions from emissions-intensive and trade-exposed industries.

Source: Environment and Climate Change Canada, National Inventory Report 1990-2015: Greenhouse Gas Sources and Sinks in Canada (2017), Part 3, Table A12-7, page 82.

Although some emissions reductions have been a result of declining industrial production, Figure 1.14 shows economic activity in some industries are similar or higher than they were in 1997 (when Statistics Canada began to report industry-specific contributions to GDP).



Figure 1.14. Gross domestic product of Ontario's industrial production, mining, quarrying, oil and gas extraction, construction and manufacturing, and forestry and logging.

Source: Statistics Canada, Gross domestic product (GDP) at basic prices, by North American Classification System (NAICS), provinces and territories (2017), CANSIM Table 379-0031.

GHG emissions attributed to the industry sector were mostly (65%) from energy use (shown above in Figure 1.7). These emissions were primarily from combustion, but also include a small quantity of emission leaks from oil and gas infrastructure (leaks, accidents, venting and flaring). Most of the energy was in the form of natural gas used for heat or, to a much lesser extent, for onsite cogenerated electricity (Figure 1.15). (Emissions from electricity generated by offsite sources are allocated to the electricity sector.) Some industries (e.g., oil and gas, pulp and paper) used their own by-products as fuel. Diesel was used for off-road industry (e.g., construction and forestry) vehicles.





Source: Natural Resources Canada, Comprehensive Energy Use Database (2016), Industry Sector, Ontario, Table 1: Secondary Energy Use by Energy Source.

The remaining (35%) emissions from the industry sector were from *industrial processes and product use*. This included cement production and was mainly in the form of carbon dioxide.


1.6 Buildings – More Space For All

Emissions from Ontario buildings increased by 32% between 1990 and 2015. This was due to growth in both residential and service industry building emissions, as shown in Figure 1.16.



Figure 1.16. Ontario's GHG emissions from buildings.

Source: Environment and Climate Change Canada, National Inventory Report 1990-2015: Greenhouse Gas Sources and Sinks in Canada (2017), Part 3, Table A12-7, page 82.

Building sector emissions increased from growth in both population and floor space per person. Fortunately, the increase in residential (but not service industry) building emissions has been slowed by energy efficiency improvements. These improvements are shown as a reduction in energy intensity (energy use divided by floor space) in Figure 1.17. There are also year-to-year energy intensity fluctuations in response to the weather (as indicated by heating degree days).

BUILDING SECTOR EMISSIONS INCREASED FROM GROWTH IN BOTH POPULATION AND FLOOR SPACE PER PERSON



Figure 1.17. Ontario's residential building floor space and energy intensity relative to 1990.

Source: Natural Resources Canada, *Comprehensive Energy Use Database* (2016), Commercial/Institutional Sector, Ontario, Table 2: Secondary Energy Use and GHG Emissions by End-Use.

Source: Natural Resources Canada, Comprehensive Energy Use Database (2016), Residential Sector, Ontario, Table 2: Secondary Energy Use and GHG Emissions by End-Use.

The vast majority (90%) of GHG emissions from the buildings sector were from energy use (shown above in Figure 1.7). These were mainly associated with natural gas (Figure 1.18) used for space heating (Figure 1.19). Other uses included water heating, cooking and on-site cogenerated electricity production. (Emissions from electricity generated by off-site sources are allocated to the electricity sector.) Non-energy use emissions included hydrofluorocarbons from refrigerants used for air conditioning and refrigeration.



Figure 1.18. Ontario's building energy use by energy source.

Source: Natural Resources Canada, *Comprehensive Energy Use Database* (2016), Residential Sector, Ontario, Table 1: Secondary Energy Use by Energy Source; Natural Resources Canada, *Comprehensive Energy Use Database* (2016), Commercial/Institutional Sector, Ontario, Table 1: Secondary Energy Use by Energy Source.



Figure 1.19. Ontario's building energy use by end use.

Source: Natural Resources Canada, *Comprehensive Energy Use Database* (2016), Residential Sector, Ontario, Table 2: Secondary Energy Use by End-Use; Natural Resources Canada, *Comprehensive Energy Use Database* (2016), Commercial/Institutional Sector, Ontario, Table 2: Secondary Energy Use by End-Use.

1.7 Agriculture – Holding Steady

Ontario's agriculture sector emissions have remained largely unchanged since 1990. Increasing emissions from crop production and on-farm fuel use have offset a decrease in animal production emissions, as shown in Figure 1.20. Declining cattle populations, as shown in Figure 1.21, have reduced emissions from animal digestion (methane) and manure management (mostly nitrous oxide). Increasing crop production resulted in additional emissions from nitrogen fertilizer use (with associated nitrous oxide).



Figure 1.20. Ontario's GHG emissions from agriculture.

Source: Environment and Climate Change Canada, National Inventory Report 1990-2015: Greenhouse Gas Sources and Sinks in Canada (2017), Part 3, Table A12-7, page 82.

Increased crop production has also contributed to higher on-farm energy use. Although cropland area has remained relatively consistent, Figure 1.21 shows a rapid increase in the area used for higher-value greenhouse vegetable production. Greenhouses, unlike field crops, require heating and typically use natural gas.⁴



Figure 1.21. Ontario's agricultural sector statistics.

Source: Ministry of Agriculture, Food and Rural Affairs, Statistical Summary of Ontario Agriculture (2017); Natural Resources Canada, Comprehensive Energy Use Database (2016), Agricultural Sector, Ontario, Table 7: Secondary Energy Use and GHG Emissions by End-Use and Energy Source.

Sources of on-farm fuel use other than natural gas have remained relatively consistent, as shown in Figure 1.22. These include gasoline and diesel use in on-farm vehicles. (All emissions from electricity use are allocated to the electricity sector, which has low emissions in Ontario.)



Figure 1.22. Ontario's agricultural sector energy use by energy source.

Source: Natural Resources Canada, Comprehensive Energy Use Database (2016), Agricultural Sector, Ontario, Table 7: Secondary Energy Use and GHG Emissions by End-Use and Energy Source.

is in 2015

1.8 Waste – A Big Question Mark

Ontario's waste sector emissions in 2015 were 16% higher than in 1990. This was due to an increase in estimated solid waste emissions (mostly methane) and, to a lesser extent, wastewater emissions (mostly nitrous oxide), as shown in Figure 1.23. Waste incineration emissions (mostly carbon dioxide) have remained relatively consistent. (Waste sector emissions exclude those from refuse trucks, which are allocated to the transportation sector.)



Figure 1.23. Ontario's GHG emissions from waste. Note the y-axis split to show wastewater and waste incineration trends.

Source: Environment and Climate Change Canada, National Inventory Report 1990-2015: Greenhouse Gas Sources and Sinks in Canada (2017), Part 3, Table A12-7, page 82.

Waste sector emission estimates are highly uncertain and may be up to 40% higher or lower than reported. For example, large landfills (over 1.5 million cubic metres) are required to capture landfill gas emissions. The methane component can be used to generate electricity or flared to produce carbon dioxide and lower the global warming potential of the emissions. However, the effectiveness of these capture systems has been questioned, which also contributes to the uncertainty. Fortunately, Ontario has been gradually diverting more solid waste away from disposal, as shown in Figure 1.24.

WASTE SECTOR EMISSION ESTIMATES ARE HIGHLY UNCERTAIN



Figure 1.24. Ontario's solid waste disposal and diversion.

Source: Statistics Canada, Disposal of waste, by source, Canada, provinces and territories (2016), CANSIM Table 153-0041; Statistics Canada, Materials diverted, by type, Canada, provinces and territories (2017), CANSIM Table 153-0043.

1.9 Electricity – Finally Coal Free

Ontario's electricity sector has seen a dramatic 80% decrease in GHG emissions from 1990 levels, as shown in Figure 1.25. As discussed above, this drop occurred because 2015 was the first complete year that coal was no longer used to generate electricity.

2015 WAS THE FIRST COMPLETE YEAR THAT COAL WAS NO LONGER USED TO GENERATE ELECTRICITY



Figure 1.25. Ontario's GHG emissions from electricity.

Source: Environment and Climate Change Canada, National Inventory Report 1990-2015: Greenhouse Gas Sources and Sinks in Canada (2017), Part 3, Table A12-7, page 82.

Some other sources of electricity have stepped up to replace coal, as shown in Figure 1.26. Although the use of natural gas has increased, it is less GHGintensive than coal and largely limited to supplying peak loads.⁵ The vast majority of Ontario's grid electricity is generated from sources that do not (directly) release GHG emissions – especially nuclear. Additional electricity was produced locally or behind-the-meter from sources including solar, diesel and biomass.



Figure 1.26. Ontario's sources of electricity.

Source: Environment and Climate Change Canada, National Inventory Report 1990-2015: Greenhouse Gas Sources and Sinks in Canada (2017), Part 3, Table A13-7, page 99.

See our 2017 Energy Conservation report *Every Joule Counts* for further discussion of Ontario's electricity sector.

Endnotes

- Environment and Climate Change Canada, National Inventory Report 1990-2015: Greenhouse Gas Sources and Sinks in Canada (Ottawa: Pollutant Inventories and Reporting Division, 2017).
- Note that the methodologies used to produce the National Inventory Report are continuously refined. This includes those used to calculate historical values. Comparisons to historical data presented here are based on the current methodology and some values will not match those presented in our previous reports.
- 3. Environment and Climate Change Canada does not have an industry sector in its economic sector breakdown. The "Industry" category was created by the Ontario Ministry of the Environment and Climate Change and is a combination of three ECCC economic sectors: oil and gas; emissions-intensive and trade-exposed; and light manufacturing, construction and forest resources. The ECO has adopted this categorization.
- "Use of Biomass for Heating Greenhouses in Ontario," online: Ministry of Agriculture, Food and Rural Affairs <<u>http://www.omafra.gov.on.ca/</u> english/crops/facts/08-015w.htm>.
- "Canadian Energy Dynamics: Review of 2014 Energy Market Assessment," online: National Energy Board <<u>https://www.neb-one.gc.ca/nrg/ntgrtd/mrkt/dnmc/2014/index-eng.html</u>>



Chapter 2 Policies and Programs Since the Climate Change Action Plan

What has happened since the release of the *Climate Change Action Plan*?

A lot, actually

Abstract

The government of Ontario has undertaken a range of policy measures since the release of the *Climate Change Action Plan* in June 2016. Most notable is the launch of the province's cap and trade program, and the generation of more than \$1.9 billion in proceeds to be used for climate mitigation efforts throughout the province. Some areas where the province has been most active in developing policy are in the buildings, waste, transportation, and land use sectors. Ontario is expected to continue to roll out programs as it works to meet the plans and objectives set out in the *Climate Change Action Plan*. Ontario linked its cap and trade market with those of Quebec and California in January 2018.

2

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2.0 Introduction

This chapter summarizes the most important developments in Ontario climate change policy since the release of the *Climate Change Action Plan* in June 2016:

- 1. The **launch of the province's cap and trade program** in January 2017, completing the first four quarterly auctions of allowances. These auctions generated over \$1.9 billion in proceeds, which the government has begun to allocate through the Greenhouse Gas Reduction Account (See Chapter 5).
- 2. The **debut of the Ontario Climate Change Solutions Deployment Corporation**, a.k.a. GreenON, an entity responsible for deploying some cap and trade revenues to enhance the uptake of low-carbon technologies in new and existing buildings.
- 3. Additional actions to **target emissions from the buildings sector**, including funding for the GreenON Installation program; expanding the Enbridge and Union Gas residential audit and retrofit programs to be province-wide and applicable to homes heated with natural gas, oil, propane and wood; increased GHG reporting requirements for large buildings; and proposed legislative changes that would improve energy efficiency in buildings.
- 4. A new legal framework for **resource recovery and waste diversion** in Ontario.
- 5. Initial steps to increase production and use of **renewable natural gas**.

- 6. Actions to increase uptake of **electric vehicles** through incentives, public charging infrastructure, and new Building Code requirements.
- 7. Actions to **increase cycling** through infrastructure funding and the identification of a province-wide cycling network.
- 8. Completion of a co-ordinated land-use planning review, followed by proposed changes to provincial land use plans that focus on **intensification and integration of transit and land use planning**.
- 9. Initial steps taken to develop **key policies around land use GHG emissions**, including an *Agricultural Soil Health and Conservation Strategy*; a *Forest Carbon Policy*; a *Wetland Conservation Strategy*; and a guide for incorporating climate change considerations into environmental assessments.

These and other key developments are outlined below, beginning with a discussion of cap and trade, followed by some highlights of complementary measures related to the *Climate Change Action Plan*. A summary of policy and program developments since June 2016 is then provided.

2.1 Cap and Trade Gets Started

Ontario's cap and trade program began its first compliance period on January 1, 2017.

2

2.1.1 2017 Auctions

Each year, the allowances available for auction are divided into four, and auctions are held quarterly. The four 2017 auctions were held in March, June, September, and November.

The first three auctions sold out of 2017 vintage allowances, while the fourth auction sold just under 83%. In the first two auctions, purchases of 2020 vintage allowances were lower (approximately 26% in the March auction and 53% in the June auction), but 2020 vintage allowances sold out in the September and November auctions. Total proceeds from the auctions brought the program's revenue to over \$1.9 billion in 2017. Proceeds from all four auctions were received in the 2017/2018 budget year and the first auction of 2018 will also occur in this budget year.

THE FIRST THREE AUCTIONS SOLD OUT OF 2017 VINTAGE ALLOWANCES, WHILE THE FOURTH AUCTION SOLD JUST UNDER 83%. THE AUCTIONS BROUGHT THE PROGRAM'S REVENUE TO OVER \$1.9 BILLION



Auction Date	Auction Results	Current 2017 Vintage	Future 2020 Vintage
March 22, 2017	Total Allowances Available for Sale	25,296,367	3,116,700
	Total Allowances Sold	25,296,367	812,000
	Total Qualified Bids Divided by Total Allowances Available	1.16	0.26
	Proportion of Allowances Purchased by Capped Participants ¹	99.1%	100%
	Allowance Settlement Price	\$18.08	\$18.07
June 6, 2017	Total Allowances Available for Sale	25,296,367	3,116,700
	Total Allowances Sold	25,296,367	1,674,000
	Total Qualified Bids Divided by Total Allowances Available	1.22	0.54
	Proportion of Allowances Purchased by Capped Participants ¹	96.1%	92.8%
	Allowance Settlement Price	\$18.72	\$18.30

Table 2.1. 2017 Auction Results

Auction Date	Auction Results	Current 2017 Vintage	Future 2020 Vintage
September 6,	Total Allowances Available for Sale	25,296,367	3,116,700
(Auction 3)	Total Allowances Sold	25,296,367	3,116,700
	Total Qualified Bids Divided by Total Allowances Available	1.19	1.53
	Proportion of Allowances Purchased by Capped Participants	96.4%	96.1%
	Allowance Settlement Price	\$18.56	\$18.03
November 29,	Total Allowances Available for Sale	25,296,369	3,116,700
2017 (Auction 4)	Total Allowances Sold	20,898,000	3,116,700
	Total Qualified Bids Divided by Total Allowances Available	0.83	1.45
	Proportion of Allowances Purchased by Capped Participants	91.5%	92.9%
	Allowance Settlement Price	\$17.38	\$18.89

2017 and 2020 Allowance Vintages – What's the Difference?

Because Ontario's first compliance period will last four years, and because Ontario has no annual reconciliation, there is no practical or legal difference between 2017 and 2020 vintage allowances. Nevertheless, bidders in the first two auctions had unsatisfied demand for 2017 allowances while leaving 2020 allowances unsold, and paid more for 2017 allowances than for 2020 allowances in the June auction. In the fourth auction, all 2020 vintage allowances sold out at a price higher than that paid for current vintage allowances, some of which remained unsold. This bidding pattern indicates that market participants are still developing their understanding of the program.

2.1.2 Cap and Trade – Who is Buying Allowances?

Beginning this year, there are two groups of *mandatory participants* who must obtain and turn in allowances or credits to cover their 2017 to 2020 GHG emissions: *large final emitters* (LFEs) and major energy distributors (see Figure 2.1).

First, LFEs are required to obtain allowances to cover their GHG emissions. LFEs consist of large industrial facilities, institutions, greenhouses, and others that directly emit at least 25,000 t CO_2e /year. Similar but smaller emitters, that each emit between 10,000 and 25,000 t CO_2e /year, can be *voluntary participants*. These facilities can choose to opt in, i.e., to be governed by the same rules as LFEs. About 80 Ontario facilities have opted to become voluntary participants. To minimize economic and carbon leakage,² the LFEs and voluntary participants will receive most of their 2017-2020 allowances free of charge during the 2017-2020 compliance period. Free allowances still provide an incentive to reduce emissions because of the ability to sell (i.e., trade) unused allowances, and because the number of free allowances declines each year.

Starting in 2018, the number of free allowances provided for combustion emissions will decline each year, at a rate slightly higher than the overall cap decline rate (namely 4.57%). The cap adjustment factor for fixed process emissions will remain 1 until 2020. Since an additional 8% of their compliance obligation can be met through offsets, large final emitters and voluntary participants may choose not to purchase many allowances at auction for 2017.



Photo credit: Creative Commons, CC0 1.0 Universal (CC0 1.0).

Major energy distributors are the second group of *mandatory participants*. These distributors consist of entities that: supply at least 200 L of fuel/year or the quantity of natural gas that would emit 25,000 t $CO_2e/$ year; or that import electricity.

Major energy distributors are likely to buy allowances to cover the emissions of their customers (including businesses and consumers, except the LFEs and voluntary participants). Major energy distributors are not eligible for free allowances, and are therefore likely to buy almost all allowances at auction. They may also buy unused allowances from other participants, or offset credits.

Preliminary data suggests that petroleum product distributors (e.g., gas or diesel) are the most likely customers for at least 60% of the Ontario allowances offered for sale at auction in 2017; this percentage could rise to 70% or higher by 2020 as discussed in Chapter 3.

A third group, known as *market participants*, do not have significant GHG emissions, and have no compliance obligations. However, they are permitted to buy and sell allowances, typically for profit. These market participants provide liquidity to carbon markets, and can help stabilize prices. As of September 12, 2017, 15 entities registered to participate as market participants (including individuals, not-for-profit organizations, and companies without compliance obligations).

A simplified overview of the emission allowance requirements for each economic sector are shown in Figure 2.1 below.



Figure 2.1. Simplified breakdown of Ontario cap and trade program allowance requirements for each economic sector.³ Size of circle represents magnitude of GHG emissions. Portion of each circle within each box approximates percentage of emissions with different allowance requirements.

Source: Environment and Climate Change Canada, National Inventory Report 1990-2015: Greenhouse Gas Sources and Sinks in Canada (2017), Part 3, Table A12-7, page 82.

Additional details can be found in our primer, Introduction to Cap and Trade in Ontario available online at eco.on.ca.

As Figure 2.1 shows, allowances are not required for the non-energy use emissions associated with agriculture and waste. The Government of Ontario is planning to create an offset market to incent reductions in these sectors, as well as the forestry sector, and could also use cap and trade revenues to reduce these non-capped emissions.

The compliance offset program is a key piece of Ontario's cap and trade system. In November 2016, the government released a Compliance Offset Credits Regulatory Proposal, which sets out the proposed framework for using offsets as compliance instruments under cap and trade. A final *Ontario Offset Credits Regulation* came into force on January 1, 2018. In November 2017, the government posted a separate proposal for developing a Voluntary Carbon Offset Program for Ontario, which will allow a broader range of entities, including those not subject to the cap, to participate in buying and selling offset credits.

Compliance offset projects will be governed by a unique set of protocols, which the government is currently developing. The first draft offset protocol (dealing with landfill gas capture) was released for comment in May 2017, with a final draft posted alongside the *Offset* *Credits Regulation* in January 2018. Other protocols are expected to be released over the next year. As part of its commitment to achieve carbon neutrality by 2018, the Ontario government has also committed to purchasing voluntary offsets.

Offsets may be particularly important to fuel distributors, who must purchase the majority of allowances sold at auction, but who have little or no control over the amount of fuel consumed, and GHGs released, by their customers. For more information on offsets and their role in Ontario's cap and trade program, see Chapter 4 of this report.

2.1.3 How Many Allowances?

The number of GHG allowances available each year is capped by Ontario Regulation 144/16. The available allowances are distributed in three ways:

- 5% go into the strategic reserve, to provide a "price collar" to cushion high price swings;
- Approximately one quarter of the allowances will be distributed free to industries who are at a risk of carbon leakage, i.e., LFEs and voluntary participants who must compete against companies outside Ontario that do not pay the same price on carbon; and
- The remainder are offered for sale at auction.

For the 2017 to 2020 compliance period, the ECO anticipates that allowances will be distributed as follows:

Table 2.2. Distribution of allowances in first compliance period (2017-2020).

Title	Percent of Cap	2017	2018	2019	2020
Cap on Allowances	100%	142,332,000	136,440,000	130,556,000	124,668,000
Allowances placed into Strategic Reserve	5%	7,116,600	6,822,000	6,527,800	6,233,400
Allowances provided free of charge to LFEs and voluntary participants	24% in 2017 and decreasing ~3% annually	34,159,680	~33,135,000	~32,141,000	~31,177,000
Remaining allowances available at auction	~71% in 2017 and declining to ~70% in 2020	101,055,720	~96,483,000	~91,887,000	~87,258,0004
Allowances		71%	71%	70%	70%

Of the declining number of allowances available at auction, a growing percentage will likely be needed by fuel distributors (see Chapter 3 for more details).

2.2 Highlights of Complementary Measures

As shown in the lengthy table below (Table 2.3), some of the areas where the government has made strides include the waste, transportation, buildings, agriculture, and forest sectors. Here is a closer look at some of the complementary measures proposed, by sector.

2.2.1 Climate Change Action in the Waste Sector

Days after releasing the new *Climate Change Action Plan*, the government passed the *Waste-Free Ontario Act, 2016*, which enacts the *Resource Recovery and Circular Economy Act, 2016* (*RRCEA*) and the *Waste Diversion Transition Act, 2016* (*WDTA*). The *RRCEA* replaces the *Waste Diversion Act, 2002* (*WDA*), and while the core function of diverting materials from landfills is maintained, the *RRCEA* has stronger enforcement mechanisms and enables greater provincial oversight on waste diversion matters. The *WDTA*, on the other hand, is temporary legislation that helps with transitioning from the *WDA* regime to the *RRCEA*.



In February 2017, the Ministry of the Environment and Climate Change also released its *Strategy for a Waste-Free Ontario: Building the Circular Economy* to reduce the volume of materials going to landfill and implement an organic waste action plan. The strategy is guided by a vision of a circular economy that produces zero waste, with zero GHG emissions coming from the waste sector. The government is also working on a *Food and Organic Waste Framework* to reduce the volume of food wasted, and to divert organic materials from disposal in landfills. Given that landfills produce about 53% of Ontario's methane emissions, diverting waste from landfills is an important piece of Ontario's climate strategy. For more information on the government's waste-reduction efforts, see the ECO's October 2017 special report, *Beyond the Blue Box: Ontario's Fresh Start on Waste Diversion and the Circular Economy*.



Over the past year, the government has made progress on some transportation-related initiatives listed in the *Climate Change Action Plan*. Transportation actions ranged from cycling to electric vehicles, and from research on renewable fuels to the development of multimodal transportation plans. Some of these key measures are discussed below.

Cycling

Adding to previous funding for municipal cycling initiatives, in May 2017 the Ministry of Transportation announced a new Ontario Municipal Commuter Cycling Program, a four-year program that will provide funding to municipalities to invest in infrastructure for commuter cycling. Funding for this is from the Greenhouse Gas Reduction Account. The ministry is also working on identifying a province-wide cycling network as detailed in #CycleOn Action Plan 1.0, which will promote connectivity between cycling infrastructure in different parts of the province.



Photo credit: Alex Mather

Electric Vehicles

The government has continued developing electric vehicle (EV) initiatives over the past year. As of September 14, 2017, 309 charging stations were installed throughout the province, and early in the year, the ministry made changes to its EV incentive program to encourage greater EV adoption. Changes included removing a limit on EV incentives to 30% of the manufacturer's suggested retail price, and eliminating the \$3,000 limit on incentives for fully battery-powered EVs priced between \$75,000 and \$150,000. Stakeholders were consulted on these initiatives as well as on a planned program to increase education and awareness of low- and zero-emission vehicles.

In May 2017, the government published O. Reg. 139/17, which sets out a series of amendments to Ontario's Building Code. The new Building Code provisions will require all new houses with parking to be built EV-ready (i.e., minimum 200 amp panel and installation of a conduit to facilitate future installation of EV charging equipment), an action the ECO recommended in Chapter 3 of our 2015/2016 Annual Energy Conservation Progress Report, Conservation: Let's Get Serious. Other buildings (except for multi-unit apartment buildings) with parking in the building (e.g., attached or underground garages) would need to be equipped with EV charging equipment in 20% of the parking spots, with the other 80% of spots made EV-ready. The primary intent of these changes is to facilitate workplace charging for EV users. These changes came into effect for new buildings in January 2018.



Photo credit: Sonia Cacoilo

Beyond personal use vehicles, the Ministry of Transportation is also targeting transportation emissions from the commercial sector. In September 2017, the ministry released a draft Green Commercial Vehicle Program that would incentivize businesses to purchase low-carbon commercial vehicles and technologies to reduce emissions. For more discussion on transportation emissions in the commercial sector see Chapter 6 of this report.

In August 2017, the Ministry of Transportation also launched an Electric School Bus Pilot Program to determine the operational reliability and costeffectiveness of electric school buses in Ontario. The pilot program will aim to determine the GHG emissions, noise, air quality and health impacts and co-benefits of switching from diesel to electric buses. However, the program remains limited in scope, and questions remain as to the feasibility of a province-wide roll out.

Renewable Fuels

As set out in the *Climate Change Action Plan*, the government intends to increase the percentage of renewable content required in transportation fuels sold in the province. In November 2017, the government released proposed changes to the *Ethanol in Gasoline* and *Greener Diesel Regulations*, including increasing minimum blending requirements for ethanol in gasoline from 5% to 10%, with the goal of reducing GHG emissions from gasoline by 5% by 2020. Actual ethanol levels in Ontario gasoline have averaged around 7%.

Sources of renewable natural gas include methane from landfills, agricultural and food-waste based materials, and wastewater treatment plants. To promote the use of renewable natural gas from some of these sources, the Ministry of Agriculture, Food and Rural Affairs also began work on developing an Agrifood Renewable Natural Gas for Transportation Demonstration Program. This program, if implemented, would help the agri-food sector transition to a lower carbon economy by investing in actions to make it easier to access new low-carbon transportation fuel technologies. The proposed program would focus on diverting organic waste from landfills to renewable fuel production, and generating energy from agricultural and food-based materials.

For more discussion of Ontario's policies on renewable natural gas, see Chapter 8 of the ECO's 2017 Annual Energy Conservation Report, *Every Drop Counts: Reducing the Energy and Climate Footprint of Ontario's Water Use*.

Multimodal Transportation Plans

Over the past year, in support of the objectives of the *Climate Change Action Plan*, the Ministry of Transportation announced plans to develop a multimodal transportation plan for the Greater Golden Horseshoe, and a multimodal transportation strategy for Ontario's North. The plan for the Greater Golden Horseshoe will include long-term (50+ years) scenario analysis to inform policy and investment decisions to support the government's goals of addressing climate change, developing the economy, and promoting new technology. The types of transportation that will be considered include highways, railways, regional transit systems, cycling and walking.

The proposed strategy for Northern Ontario will guide improvements to road, rail, air and marine transport through a planning horizon of 2041. It will take into consideration climate change impacts and the natural environmental features in the North, and as drafted, the strategy contains a vision statement, five goals, and 37 directions to guide northern transportation policies, programs and investment opportunities.

2.2.3 Climate Change Action in the Buildings Sector

In July 2016, the Ministry of Municipal Affairs released technical standards outlining how to comply with the higher energy efficiency requirements in the Ontario Building Code that took effect in 2017. As noted above, in May 2017, the government published O. Reg. 139/17, which sets out a series of amendments to Ontario's Building Code dealing with electric vehicle charging. Two months later, O. Reg. 20/17, *Reporting of Energy Consumption and Water Use* came into force, requiring large buildings (50,000 square feet or larger) to report publicly on their energy and water use and their GHG emissions, similar to reporting requirements enacted in 2011 for buildings in the broader public sector.



Photo credit: Creative Commons, CC0 1.0 Universal (CC0 1.0).

Further Building Code changes were proposed in July 2017, when the ministry introduced a second batch of Building Code amendments that would further improve building energy efficiency for new buildings and renovations of pre-existing ones. The changes proposed in July would also see the installation of hurricane straps and backwater valves in new houses as part of climate adaptation. Hurricane straps are steel straps used to connect a roof to a supporting wall in houses with wood frames. By strengthening the connection between a house's roof truss and wall assembly, hurricane straps are meant to improve building resilience in high wind events. Backwater valves are one-way valves used to prevent sewage from entering a building from over-flowing municipal wastewater systems during extreme rain events.

In June 2016, the government released its *Climate Change Action Plan*, which sets out complementary measures designed to support GHG reductions achieved through cap and trade. One of the main ways in which the government plans to implement the *Climate Change Action Plan* is through the newly formed Ontario Climate Change Solutions Deployment Corporation (a.k.a. GreenON). GreenON was established in February 2017, and is a non-share capital corporation designed to increase the uptake of clean technologies and maximize greenhouse gas reductions in the building sector.

2.2.4 Climate Change Action in the Agriculture and Forest Sectors

While some large industries in the agricultural and forestry sectors (such as food manufacturers, greenhouses or pulp and paper companies) have compliance obligations under cap and trade, many of the emissions from these sectors are not covered by the cap, despite contributing significantly to Ontario's total greenhouse gas emissions.

Harnessing the potential of the agriculture and forestry sectors could play a key role in achieving Ontario's climate change targets. In addition to the initiatives described below, Ontario plans to include projects in the agriculture and forest sectors in its offset program (see Chapter 4 of this report for further information).

Agricultural Soils

In August 2016, the Ministry of Agriculture, Food and Rural Affairs initiated discussions on developing an *Agricultural Soil Health and Conservation Strategy* for Ontario, and in November 2017, the ministry released a draft strategy titled *New Horizons: Ontario's Draft Agricultural Soil Health and Conservation Strategy*. The proposed strategy focuses on improving soil management practices through incentives, capacity building and educational initiatives to improve soil knowledge and management, as well as improved soil health tracking and erosion monitoring.





Natural Resources and Forests

In November 2016, the Ministry of Natural Resources and Forestry (MNRF) released a discussion paper on opportunities to enhance carbon storage in Ontario's Crown forests. The two proposed policy approaches that the ministry put forward focus on forest carbon management and forest carbon offset projects. Policies being considered under both approaches are intended to either reduce emissions or increase the amount of carbon stored in forests and/or wood products. Forest offsets are examined in Chapter 4 of this report.

In June 2017, the MNRF released its *State of Ontario's Natural Resources – Forests 2016 Report*, covering information about the health and wellbeing of Ontario's forests over the last five years. The report dedicated a chapter to the topic of climate change, including mitigation and adaptation aspects of forest management planning in a changing climate.

Outside of the work being undertaken on forest carbon, the MNRF released a *Wetland Conservation Strategy* in the summer of 2017, which discusses the importance of wetlands in mitigating and adapting to the effects of climate change. The strategy aims to halt net loss of wetland area and function where wetland loss has been the greatest by 2025, and by 2030, achieve a net gain in wetland area and function in those same areas. 2

2.3 Developments in Ontario Policy and Program Implementation

The table that follows summarizes policy and program developments in Ontario since the *Climate Change Action Plan*. Proposals are included for action items where a final decision has not yet been made. Where policy or program decisions have been made, the proposals that preceded those decisions are not included. Information pertaining to funding announcements, grants, or other disbursements specifically of cap and trade funds can be found in Chapter 5 of this report.

Table 2.3. Policy and Program Developments since the Climate Change Action Plan.

JUNE 2016

Initiative	Comments
Government releases <i>Climate Change Action</i> <i>Plan</i> that outlines government initiatives across multiple sectors to reduce greenhouse gas emissions.	The <i>Climate Change Action Plan</i> outlines over 90 specific initiatives the government intends to carry out to support emissions reductions in Ontario with the funds generated from cap and trade allowance auctions. Action areas include the transportation, building, and land use sectors. While the government claims that the <i>Plan</i> will result in reductions of 9.8 Mt CO ₂ e by 2020, the ECO remains skeptical.
Waste-Free Ontario Act, 2016 is passed. Legislation enacts the Resource Recovery and Circular Economy Act, 2016 and the Waste Diversion Transition Act, 2016.	The Waste-Free Ontario Act, 2016, is intended to enable the creation of a suite of laws and policies that will reduce the volume of food wasted in Ontario, and divert organic materials from disposal in Ontario landfills. If Ontario's new waste-free framework is implemented effectively, it could decrease methane emissions from landfills. However, it is unlikely that the province will become truly waste free based on current modes of production and consumption. See the ECO's report, <i>Beyond the Blue Box: Ontario's Fresh Start on Waste Diversion and the Circular Economy</i> .



Photo credit: Creative Commons, CC0 1.0 Universal (CC0 1.0).

JULY 2016

Initiative	Comments
Ministry of Transportation releases locations of electric vehicle charging stations.	Ontario is building almost 500 electric vehicle (EV) charging stations at approximately 250 locations across the province. Given that about 35% of Ontario's emissions come from the transportation sector, facilitating uptake of low- and zero-emission vehicles could help Ontario to achieve its mitigation target. However, current EV adoption rates remain low, and range anxiety remains a significant deterrent to EV uptake.
Ministry of Municipal Affairs amends supplementary standard for energy efficiency in houses (SB-12), detailing compliance paths for achieving the energy efficiency requirements in the Ontario Building Code that take effect in 2017.	Buildings, and the energy they consume, account for almost a quarter of Ontario's total GHG emissions. To target these emissions, the government intends to roll out successive changes to the Building Code that would improve energy efficiency.
Government selects Wataynikaneyap Power to connect 16 remote First Nation communities in northwestern Ontario, currently relying on diesel power, to the province's electricity grid, in keeping with Ontario's <i>Climate Change</i> <i>Action Plan</i> .	This project is designed to connect First Nation communities to the Ontario electricity grid to replace dirty and expensive diesel-fired electricity.



Photo credit: Creative Commons, CC0 1.0 Universal (CC0 1.0).



AUGUST 2016

2

Initiative	Comments
Premier signs joint declaration with Quebec	Since August 2016 Ontario, California and Quebec have been working
and Mexico to develop carbon markets and a	with Mexico to develop an emissions trading system. This could have
Memorandum of Understanding with Jalisco,	ramifications for the Western Climate Initiative market, particularly with
Mexico.	respect to the amount and quality of compliance instruments available.

SEPTEMBER 2016

Ministry of Energy suspends the second phase of the Large Renewable Energy Procurement process and Energy-from-Waste Standard Offer Program.	This move halted procurement of over 1,000 megawatts (MW) of solar, wind, hydroelectric, bioenergy and energy from waste projects. According to the government, it will save up to \$3.8 billion in electricity system costs relative to Ontario's 2013 <i>Long-Term Energy Plan</i> (LTEP) forecast.
Ministry of the Environment and Climate Change seeks input on incorporating climate change considerations into environmental assessments (Environmental Registry # 012- 5806).	According to the government, the proposed guidance document will assist project proponents in considering climate change in environmental assessments, with the goal of ensuring climate change mitigation and adaptation are taken into account in project planning and government decision-making processes. A final guidance document was subsequently posted in November 2017.



Photo credit: Ian Muttoo/CC BY-SA 2.0

OCTOBER 2016

Initiative	Comments
Ministry of Transportation seeks input on program design regarding electric vehicle incentives, charging infrastructure, and education and awareness initiatives for low- emission vehicles (Environmental Registry # 012-8727).	Close to 35% of Ontario's emissions come from the transportation sector. Low- and zero-emission vehicles can be an important part of Ontario's transition to a low-carbon economy.
Ministry of Transportation seeks input on cycling infrastructure (Environmental Registry # 012-8772).	Personal vehicle use accounts for almost 20% of Ontario's emissions. Targeting these emissions will require a multi-pronged strategy involving better urban planning, greater uptake of low-emission vehicles, and greater participation in active modes of transportation (among other policy measures). The government's plans to upgrade cycling infrastructure could contribute to emissions reductions in the transportation sector, but as noted in the <i>Climate Change Action Plan</i> , these types of initiatives won't likely achieve significant reductions until after 2020.



Photo credit: Ontario Growth Secretariat, Ministry of Municipal Affairs



NOVEMBER 2016

Initiative	Comments
Ministry of Transportation announces it is developing a <i>Greater Golden Horseshoe</i> <i>Multimodal Transportation Plan</i> (Environmental Registry # 012-9054).	The study is geared toward advancing transportation planning in the Greater Golden Horseshoe, and providing planning direction to transportation agencies and service providers for all modes of transportation (including highways, railways, regional transit systems, cycling and walking). The main aim of the study is to create a 30-year multimodal transportation plan, which is expected to include strategies, policies and action priorities to support economic growth and the fulfillment of environmental objectives, including climate change mitigation.
Ministry of Natural Resources and Forestry seeks input on enhancing carbon storage in Ontario's Crown Forests (Environmental Registry # 012-8685).	Management practices used in Ontario's Crown forests can influence the amount of carbon stored in trees and wood products or released into the atmosphere. The Ministry of Natural Resources and Forestry is undertaking research on the role of managed Crown forests in mitigating climate change, including opportunities to increase the amount of carbon stored in forests and harvested wood products (see Chapter 4 of this report for further discussion).



DECEMBER 2016

Initiative	Comments
Ministry of the Environment and Climate Change releases its <i>Excess Soil Management</i> <i>Policy Framework</i> focused on enhancing beneficial reuse of excess soil and reducing GHG emissions associated with soil movement (Environmental Registry # 012-6065).	Healthy soil takes decades to build, but can be degraded much more quickly. While soil can be a source of GHG emissions, it could also be a significant carbon sink. Protecting soil health is an important part of climate policy in Ontario.
Ministry of the Environment and Climate Changes releases technical amendments to cap and trade program (Environmental Registry # 012-8953).	The changes to the cap and trade program were designed to address issues around free allocations and reporting.
Ontario and Quebec sign electricity trade agreement between Hydro-Québec and the Independent Electricity System Operator (IESO) to import hydroelectric power to replace natural gas use.	Under this agreement, the IESO will purchase a total of 14 terawatt hours (TWh) of electricity from Hydro-Québec over a seven-year period from 2017 to 2023. According to the government, the agreement is expected to reduce the cost to electricity consumers by \$70 million. However, it will only reduce Ontario emissions by 1 million tonnes annually (less than 1% of Ontario's annual total).



Photo credit: Creative Commons, CC0 1.0 Universal (CC0 1.0).



JANUARY 2017

Initiative	Comments
Cap and trade first compliance period (2017-2020) begins.	Capped emitters are now required to purchase compliance instruments or reduce their emissions to meet their compliance obligations.
Ministry of Transportation amends the Electric Vehicle Incentive Program to increase the incentive amounts offered for some electric vehicles.	As indicated above, low- and zero-emission vehicles can be an important part of Ontario's transition to a low-carbon economy.

FEBRUARY 2017

Ministry of Finance issues third green bond and raises \$800 million, some of which will be used for transportation infrastructure.	According to the government, proceeds from the bond will support 12 projects, from LEED certification for various buildings to rapid transit expansion. Emissions from the transportation and building sectors account for more than 50% of Ontario's GHG emissions.
Ministry of Agriculture, Food and Rural Affairs develops a provincial <i>Pollinator Health Action</i> <i>Plan</i> to enhance the health of Ontario's pollinators by addressing key stressors, including climate change (Environmental Registry # 012-6393).	Over one third of our diet comes directly or indirectly from insect- pollinated plants. Among the threats to pollinators are the effects of climate change. The <i>Pollinator Health Action Plan</i> , in keeping with the 2014 <i>Pollinator Health Strategy</i> , aims to achieve a 15% over-winter honey bee mortality rate by 2020 and an 80% reduction in the number of hectares planted with neonicotinoid-treated corn and soybean seed by 2017. Protecting pollinators will be increasingly important as climate change continues to jeopardize global food production.
Ministry of the Environment and Climate Change releases the <i>Lake Simcoe Climate</i> <i>Adaptation Strategy</i> (Environmental Registry # 011-8148).	The Lake Simcoe Climate Adaptation Strategy sets out an adaptive management approach to drive actions in the Lake Simcoe watershed to adapt to the impacts of climate change. According to the government, the new approach aims to help Lake Simcoe become more resilient in the face of future climate variability.
O. Reg. 46/17 establishes the Climate Change Solutions Deployment Corporation (a.k.a. GreenON) to enhance the uptake of low-carbon technologies in new and existing buildings (Environmental Registry # 012-9270).	Buildings, and the energy they consume, account for almost a quarter of Ontario's total GHG pollution. The creation of GreenON, along with other building-related measures, could help promote technology switching and energy conservation among Ontario households and businesses. However, the Corporation has yet to announce its procurement, scheduling and management processes for the roll out of all of its incentive programs. The success of programs administered under GreenON is therefore yet to be determined.
Ministry of the Environment and Climate Change releases Ontario's <i>Strategy for a</i> <i>Waste-Free Ontario</i> to reduce the volume of materials going to landfill. The strategy includes a commitment to implement an organic waste action plan.	Given that landfills produce close to 53% of Ontario's reported methane emissions, diverting waste from landfills is an important piece of Ontario's climate strategy.

MARCH 2017

Initiative	Comments
First quarterly cap and trade auction raises \$472 million.	For auction results, see Table 2.1.
Ministry of Natural Resources and Forestry proposes a <i>Natural Resource Climate</i> <i>Adaptation Strategy</i> – a five-year framework to guide adaptation activities (Environmental Registry # 012-9499).	The strategy outlines 23 specific actions the Ministry of Natural Resources and Forestry will take to improve climate adaptation and resilience in the natural resources sector.
Treasury Board releases its Statement of Environmental Values (SEV) which includes a commitment to consider climate change mitigation and adaptation as part of the government decision-making process (Environmental Registry # 012-8645).	Treasury Board's SEV now states that it will consider climate change in its decision-making processes. While SEVs do not impose substantive or binding obligations on ministries, it is possible that this change could lead to more targeted and effective spending on climate change initiatives.



2

APRIL 2017

Initiative	Comments
Ministry of the Environment and Climate Change approves the revised Drinking Water Quality Management Standard, which requires that system owners and operating authorities consider climate change when assessing risks to a drinking water system (Environmental Registry # 012-5530).	Freshwater sources and water infrastructure are expected to become increasingly strained as the effects of climate change become more pronounced. While the amendments to the Drinking Water Quality Management Standard that incorporate climate change considerations are a step in the right direction, more needs to be done to integrate climate change considerations in the management of Ontario's drinking water systems.
Ministry of Transportation seeks input on draft province-wide cycling network (Environmental Registry # 013-0190).	Personal vehicle use accounts for almost 20% of Ontario's emissions. As part of a suite of measures designed to target these emissions, the government is focusing on promoting more active modes of transportation. However, this measure is not likely to displace a significant amount of commuter traffic, as it is more geared toward recreational cycling across the province.
Ministry of the Environment and Climate Change seeks input on an <i>Excess Soil</i> <i>Management Regulatory Proposal</i> , designed to enhance reuse of excess soil and reduce greenhouse gas emissions associated with soil movement (Environmental Registry # 013-0299).	Large scale soil movements associated with construction, and with disposal of surplus soil, have created several interlocking environmental problems, including fossil fuel consumption for trucking.



Photo credit: Creative Commons, CC0 1.0 Universal (CC0 1.0).

MAY 2017

Initiative	Comments
Ministry of Agriculture, Food and Rural Affairs seeks feedback on developing an Agrifood Renewable Natural Gas for Transportation Demonstration Program (Environmental Registry # 013-0316).	Using renewable natural gas from agricultural and food waste-based materials for transportation, instead of fossil fuels, could reduce GHG emissions. See the ECO's report, <i>Every Drop Counts: Reducing the Energy and Climate Footprint of Ontario's Water Use</i> , Chapter 8.
Government publishes Building Code amendments in O. Reg. 139/17, requiring new houses with parking to be equipped for future EV charging installation, and large buildings (except for multi-unit apartment buildings) to be equipped with EV charging equipment in a portion of the parking spots. The changes come into force on January 1, 2018.	As indicated above, low- and zero-emission vehicles can be an important part of Ontario's transition to a low-carbon economy.
Ministry of Municipal Affairs releases four updated land use plans: <i>Growth Plan for</i> <i>the Greater Golden Horseshoe; Niagara</i> <i>Escarpment Plan; Greenbelt Plan;</i> and <i>Oak Ridges Moraine Conservation Plan.</i> Intensification/density targets are increased and municipalities are required to include climate change policies in official plans, develop storm water management plans, and conduct vulnerability risk assessments. Municipalities are also encouraged to develop GHG inventories, reduction strategies and establish targets and performance measures.	According to the government, the updated land use plans are meant to promote economic development while also preserving and protecting green spaces, farmland and ecologically sensitive areas from development. If implemented effectively, the new plans could reduce long-term GHG emissions by protecting carbon sinks, curbing urban sprawl, and reducing emissions from transportation.
Ministry of the Environment and Climate Change releases proposed <i>Landfill Gas Offset</i> <i>Protocol</i> (Environmental Registry # 013-0480) that outlines the process to capture and destroy methane gas from landfills.	Landfills produce close to 53% of Ontario's methane emissions. The gas can be captured and destroyed through flaring or other processes, which can greatly reduce the net GHG emissions released into the atmosphere from landfills, and provide local co-benefits for Ontario communities.
Ministry of Municipal Affairs seeks input on proposed <i>Building Better Communities and</i> <i>Conserving Watersheds Act, 2017</i> , which would amend existing legislation to give communities a stronger voice in land use planning. This would include supporting government priorities on climate change (Environmental Registry # 013-0590).	The proposed legislation, if implemented, would give municipalities broader powers in the land use planning process, including by allowing municipal leaders to develop transit projects with fewer barriers. This could help bolster GHG emissions reductions from the building and transportation sectors, which together account for more than 50% of Ontario's GHG emissions.

MAY 2017

Initiative	Comments
Ministry of the Environment and Climate Change seeks input on its revised Statement of Environmental Values (SEV) that places a greater emphasis on climate change considerations (Environmental Registry # 013-0644).	Changes to MOECC's SEV state that the ministry will further integrate climate change considerations in ministry decisions. While SEVs do not impose substantive or binding obligations on ministries, it is possible that this change could lead to more targeted and effective spending on climate change initiatives.



Photo credit: Creative Commons, CC0 1.0 Universal (CC0 1.0).
JUNE 2017

Initiative	Comments
Second quarterly cap and trade auction raises \$504 million.	For auction results, see Table 2.1.
Ministry of the Environment and Climate Change seeks input on development of proposed <i>Low Impact Development</i> <i>Stormwater Management Guidance Manual</i> (Environmental Registry # 012-9080).	 According to the government, the proposed Low Impact Development (LID) Stormwater Management Guidance Manual is intended to support ongoing implementation of Climate Ready: Ontario's Adaptation Strategy and Action Plan, including the commitment to develop better guidance for stormwater management in the face of a changing climate. Application of LID techniques could increase the resilience of urban infrastructure by limiting the impact of extreme precipitation events, which are projected to happen more frequently as a result of a changing climate. See the ECO's special report, Urban Stormwater Fees: How to Pay for What We Need. However, the government is well behind its projected completion dates for items in the 2011-2014 adaptation plan and, at the time of writing, no updated plan has been published. The usefulness of this proposed Manual, and its interactions with other policies associated with the Climate Change Action Plan, is yet to be determined.
Ministry of Natural Resources and Forestry releases its <i>State of Ontario's Natural</i> <i>Resources – Forests 2016 Report</i> , which discusses the state of indicators related to climate change (Environmental Registry # 013-0511).	In past years, climate change has not figured largely in decisions made by MNRF. Preliminary actions taken by the ministry over the past year could signal better climate change consideration in MNRF decision making around natural resource development. Questions remain as to the best ways to harness the carbon storage potential of Ontario's forests (see Chapter 4 of this report for further discussion).



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JULY 2017

Initiative	Comments
On July 1, 2017, O. Reg. 20/17, <i>Reporting of</i> <i>Energy Consumption and Water Use</i> came into force, requiring large privately owned buildings and some industrial buildings to report building energy, water and GHG emissions data to the Ministry of Energy on an annual basis (Environmental Registry # 012-6904).	Depending on how effectively this new legislation is implemented, the new reporting requirements in O. Reg. 20/17 may provide the government with important missing data about energy use and emissions in the building sector. This data could trigger better actions to reduce GHG emissions from buildings in the province.
Ministry of the Environment and Climate Change makes technical changes to aspects of the cap and trade program (Environmental Registry # 013-0104).	The changes to the cap and trade program were designed to update sector benchmarks in the beer and industrial ethanol sectors to address emissions from co-generation, and refine the method for determining the distribution of transitional allowances.
Ministry of Transportation seeks input on a draft <i>Multimodal Transportation Strategy</i> for Northern Ontario, developed jointly with the Ministry of Northern Development and Mines (Environmental Registry # 013-0889).	The draft strategy is geared toward a northern transportation system that considers road, rail, air and marine transport modes, and takes into consideration climate change impacts and the natural environmental features of Northern Ontario. The draft strategy has a planning horizon of 2041. While the final design of the strategy has not yet been made public, the government is likely to face difficult decisions with respect to the feasibility of achieving widespread adoption of low-carbon vehicles; the maintenance of ice roads in a rapidly warming climate; and public buy-in from northern Ontario residents, among other considerations.
Ministry of Municipal Affairs looks for input on proposed changes to the Building Code which would reduce GHG emissions in the building sector and assist in climate adaptation efforts in support of the <i>Climate Change Action Plan</i> (Environmental Registry # 013-0536).	In order to target building emissions, the government intends to roll out successive changes to the Building Code that would improve energy efficiency in Ontario homes and help homeowners better adapt to a changing climate. A number of changes are being proposed over the coming years, which could lead to confusion amongst members of the building sector. However, these new proposed requirements have been generally well received, and if implemented, could contribute meaningfully to Ontario's climate change adaptation and mitigation efforts.
Ministry of Natural Resources and Forestry releases <i>A Wetland Conservation Strategy for Ontario 2017-2030</i> , which includes discussion of the importance of wetlands in mitigating and adapting to the effects of climate change (Environmental Registry # 012-7675).	Ontario is home to more than 30 million hectares of wetlands which provide many environmental and socio-economic co-benefits, including carbon storage. The proposed strategy, which includes a discussion on the possibility of a wetland offset program for Ontario, sets ambitious targets which if achieved, could greatly contribute to Ontario's climate mitigation and ecosystem protection goals. However, without a more concrete framework in support of the strategy, it is difficult to ascertain how likely it is to succeed in achieving its intended goals.



AUGUST 2017

Initiative	Comments
Ministry of Agriculture, Food and Rural Affairs seeks input on draft Statement of Environmental Values (Environmental Registry # 013-1077).	The ministry's SEV states that it will continue to work with stakeholders to move toward a low-carbon economy. While SEVs do not impose substantive or binding obligations on ministries, it is possible that this change could lead to more targeted and effective spending on climate change initiatives.
Ministry of Economic Development and Growth seeks input on draft Statement of Environmental Values (Environmental Registry # 013-1258).	The ministry's SEV states that it will continue to work with stakeholders to move toward a low-carbon economy. While SEVs do not impose substantive or binding obligations on ministries, it is possible that this change could lead to more targeted and effective spending on climate change initiatives.

SEPTEMBER 2017

Third quarterly cap and trade auction raises almost \$526 million.	For auction results, see Table 2.1.
Ministry of Transportation seeks input on proposed Green Commercial Vehicle Program, which would encourage wider adoption of low- or zero-GHG emission vehicles and technologies in commercial fleets (Environmental Registry # 013-1381).	The proposed program offers a series of rebates on low- and no- carbon vehicles and technologies for commercial operators. The <i>Climate Change Action Plan</i> estimates that together with an increase in low-emission fuelling stations and improvements to short-line railways, the Green Commercial Vehicle Program could achieve 400,000 tonnes of reductions by 2020. See Chapter 6 of this report for further discussion.
Ontario signs linkage agreement with Quebec and California.	Compliance instruments created by any of the three linked jurisdictions will be fully interchangeable for compliance purposes amongst capped participants in the three jurisdictions.

OCTOBER 2017

Initiative	Comments
Ministry of the Environment and Climate Change seeks input on a draft <i>Ontario Offset</i> <i>Credits Regulation</i> , incorporating the draft landfill gas protocol (Environmental Registry # 013-1460).	The proposed regulation sets out the framework for the creation of offset credits, including the overall process, criteria and administrative requirements, and incorporates the proposed landfill gas protocol. The proposed regulation will allow for additional protocols to be incorporated as they are developed (see Chapter 4 for further discussion of offsets).
Ministry of Natural Resources and Forestry releases Naturally Resilient: MNRF's Natural Resource Climate Adaptation Strategy (2017- 2021).	Ontario's natural resources and ecology are already being stressed by changes to the climate. MNRF's climate adaptation strategy establishes a five-year framework intended to assist the ministry in adapting to key climate change vulnerabilities. However, the strategy contains very few concrete examples, making it difficult to determine its likely outcomes.
Ministry of Energy releases the province's 2017 Long-Term Energy Plan.	The <i>Long-Term Energy Plan</i> sets out a series of programs and policies for directing Ontario's energy future over the next 20 years. The Plan could have a significant impact on Ontario's climate mitigation efforts, but it is not clearly linked to Ontario's climate targets. (See the ECO's special report, <i>Developing the 2017 Long-Term Energy Plan</i>).



Photo credit: Andrew Williamson

NOVEMBER 2017

Initiative	Comments
Ministry of Agriculture, Food and Rural Affairs seeks input on draft <i>Agricultural Soil</i> <i>Health and Conservation Strategy</i> for Ontario (Environmental Registry # 013-1373).	Healthy soil takes decades to build, but can be degraded much more quickly, and farming practices may jeopardize soil health. While soil can be a source of GHG emissions, it could also be a significant carbon sink. Therefore, protecting agricultural soil health is an important part of climate policy in Ontario (See the ECO's special report, <i>Putting Soil Health First: A Climate-Smart Idea for Ontario</i>).
Ministry of the Environment and Climate Change releases a proposed Food and Organic Waste Framework to reduce the volume of food wasted, and to divert organic materials from disposal in landfills (Environmental Registry # 013-1814).	Landfills produce methane emissions, that are not covered by the cap. Diverting organic waste from landfills is important to reducing methane emissions. See the ECO's special report, <i>Beyond the Blue Box:</i> <i>Ontario's Fresh Start on Waste Diversion and the Circular Economy</i> .
Ministry of the Environment and Climate Change solicits feedback on a proposed <i>Approach to Climate Change Adaptation</i> (Environmental Registry # 013-1520).	While Ontario has made significant efforts to boost climate mitigation (GHG reductions), the province has lagged in preparing to adapt to climate change. The proposed <i>Approach to Climate Change Adaptation</i> , if implemented, would create a new climate change adaptation organization; a province-wide risk assessment of climate impacts; an all-of-government approach to adaptation; and efforts to build public awareness about the effects of climate change.
Ministry of the Environment and Climate Change introduces amendments to existing regulations, and plans for new regulations, under the <i>Climate Act</i> (Environmental Registry # 013-1457).	The proposed amendments to the cap and trade program regulations provide for linking; set 2021-2030 caps; and establish other administrative amendments to improve data reliability and program efficiency. The government also proposed a draft Service Regulation to provide clarity as to how documents can be given or served under the Act. An Administrative Penalties Regulation, still in the works, would establish administrative penalties for contraventions of the Act and its regulations. Together, these changes, if implemented, could improve compliance and transparency.
Ontario announces a <i>Long-Term Infrastructure</i> <i>Plan 2017</i> .	The <i>Long-Term Infrastructure Plan 2017</i> is the third annual update to the province's \$190-billion, 13-year infrastructure plan. The plan includes a chapter on climate change and its impacts on infrastructure throughout the province. The government commits to using lower- carbon building materials; integrating life-cycle assessment into infrastructure planning, procurement, business case development and decision making; and applying a social cost of carbon in infrastructure planning and decisions. These changes could help improve the resiliency of Ontario infrastructure to climate impacts, and reduce the role of the sector in generating GHG emissions.

2

NOVEMBER 2017

Initiative	Comments
Ministry of the Environment and Climate Change proposes changes to the <i>Ethanol</i> <i>in Gasoline</i> and <i>Greener Diesel Regulations</i> (Environmental Registry # 013-1929).	The proposed regulatory changes to the <i>Ethanol in Gasoline</i> and <i>Greener Diesel Regulations</i> would increase ethanol blending requirements from 5% to 10%, improve the environmental performance of fuels, and recognize emerging clean fuel technologies.
Fourth quarterly cap and trade auction raises over \$422 million.	For auction results, see Table 2.1.
Ministry of the Environment and Climate Change solicits feedback on a proposed Voluntary Carbon Offsets Program for Ontario (Environmental Registry # 013-1634).	The proposed voluntary carbon offsets program would be separate and distinct from the proposed compliance offsets program. Capped emitters would not be able to use voluntary carbon offset credits to meet their compliance obligations under the cap and trade program. However, voluntary offset credits could allow government, the private sector, and other Ontarians to reduce their carbon and ecological footprints. The provincial government has pledged to buy voluntary offsets so as to make its direct operations carbon neutral by 2018.

Endnotes

- 1. The remainder were purchased by market participants (i.e., those who buy or sell carbon allowances without being obliged to do so).
- 2. For further information on the role of free allowances in reducing economic and carbon leakage, see the ECO's report, *Facing Climate Change*, at 68.
- 3. Government of Ontario, "Greenhouse gas emissions reporting by facility," online: https://www.ontario.ca/data/greenhouse-gas-emissions-reporting-facility [Accessed November 17, 2017]. Approximately 80% of the GHG emissions allocated to the industry sector are from large final emitters. None of the GHG emissions allocated to the transportation sector are from large final emitters, but nearly all are from energy use. Nearly none of the GHG emissions allocated to the buildings sector are from large final emitters, but nearly all are from energy use. Nearly none of the GHG emissions allocated to the buildings sector are from large final emitters, but nearly all are from energy use. Noer of the GHG emissions allocated to the agricultural sector are from large final emitters, but nearly all are from energy use. None of the GHG emissions allocated to the agricultural sector are from large final emitters, but nearly all are from energy use. None of the GHG emissions allocated to the agricultural sector are from large final emitters, but nearly all are from energy use. None of the GHG emissions allocated to the agricultural sector are from large final emitters, but 17% are from energy use. Note that accounting for the agricultural sector does not include food manufacturers, which are captured under the industry heading. Some agri-food businesses are large final emitters, and would therefore be eligible for free allowances until 2020. None of the GHG emissions allocated to the waste sector are from large final emitters or energy use.
- 10% of these are being made available as 2020 vintage allowances in the 2017 auctions (O Reg.144/16, *The Cap and Trade Program*, s. 57).

Chapter 3 The National and International Context for Ontario's Climate Policy

Abstract

Climate change is a global challenge, and Ontario's ability to achieve the emissionsreduction targets in the *Climate Change Mitigation and Low-carbon Economy Act, 2016* is strongly affected by the evolving national and international context.

The *Pan-Canadian Framework on Clean Growth and Climate Change* requires all Canadian jurisdictions to put a price on carbon, somewhat reducing concerns about competitiveness across provinces. The federal government is likely to accept Ontario's cap and trade program as fulfilling Ontario's obligations under the Pan-Canadian Framework.

As planned, Ontario has linked its carbon market with its Western Climate Initiative (WCI) partners, California and Quebec. This increases the size and liquidity of the market and should reduce the cost of cap and trade for Ontarians, especially those who buy transportation fuel. The carbon market should also work more smoothly and with more price stability than an unlinked system although not all auctions are likely to sell out. In addition, the link with WCI supports a secondary market for allowances, which may help Ontario industries fund emissions reductions here.

The National and International Context for Ontario's Climate Policy



3

Ontario is no longer forecast to have a significant shortage of allowances in the next few years, and Ontario emitters may not need to buy many out-of-province allowances. Together with the steps that California is taking to reduce their oversupply of allowances, large cash flows to California have become less likely. Additional efforts to address oversupply will help maintain the integrity of the cap, which provides the key benefit of cap and trade: environmental certainty by setting a limit on GHG emission allowances.

Carbon pricing and carbon markets continue to grow around the world, producing economic and environmental gains. However, the decision of the United States to pull out of the Paris Agreement may complicate Ontario's plans to count California allowances as greenhouse gas reductions here. While the federal government is already counting on WCI allowances, the international community is still determining how international emissions trading will count towards nationally defined contributions and targets.

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Ontario's climate policy and programs are affected by important developments in climate policy, nationally and internationally.

3.0 The Pan-Canadian Framework

In Canada, the federal government has taken steps to implement its pledge under the Paris Agreement. On December 9, 2016, the federal government and most of the country's premiers signed the *Pan-Canadian Framework on Clean Growth and Climate Change*. which sets out a country-wide approach to putting a price on carbon pollution and other measures to achieve greenhouse gas (GHG) reductions across the Canadian economy. The projected Canada-wide emissions reductions resulting from the federal minimum carbon price are 40 Mt by 2025.¹

As spelled out in Annex I of the Pan-Canadian Framework,² provinces and territories can adopt either a carbon tax (like British Columbia), or a cap and trade system (like Ontario and Quebec). For jurisdictions with a carbon tax system, the carbon price must start at a minimum of \$10 per tonne in 2018 and rise by \$10 per year to \$50 per tonne in 2022. Provinces that adopt a cap and trade approach must have:

- A 2030 emissions-reduction target that is equal to or greater than Canada's national Paris commitment, which is 30% below 2005.
 - The 2030 target in Ontario's *Climate Change Mitigation and Low-carbon Economy Act, 2016* (the "*Climate Act*") easily meets this requirement. Ontario's 2005 GHG emissions were 204 Mt. To meet the federal requirement of 30%, Ontario's 2030 emissions would need to be 143 Mt. Ontario's *Climate Act* reduction target for 2030 (a 37% reduction based on 1990 levels), is much more stringent, approximately 115 Mt of emissions.
- 2. Declining (more stringent) annual caps to at least 2022 that correspond, at a minimum, to the projected emissions reductions resulting from the carbon price that year in price-based systems.
 - The *Cap and Trade Program*, O. Reg. 144/16 has declining annual caps from 2017 to 2030. The cap declines at about 4% per year until 2020 and then about 2.9% per year from 2021 to 2030. This meets the second federal requirement.



Figure 3.1. Ontario's cap compared to historical emissions and the PCF requirement of 30% below 2005 levels.

Accordingly, Ontario's cap and trade system likely meets the federal requirements and is an acceptable alternative to the federal minimum carbon price, at least until the planned review of the Pan-Canadian Framework in early 2022. Other provinces, such as Nova Scotia, are also considering cap and trade for part or all of their carbon pricing. Overall, the cap is designed to result in more efficient and cost-effective emissions reductions than a high price signal (like a carbon tax).

The Pan-Canadian Framework may foster increased collaboration on carbon pricing and other GHGreduction initiatives. For example, the Canadian Council of Ministers of the Environment are working on a Canada-wide offset framework (for more information, see Appendix B, available online only at eco.on.ca). Such an offset framework could assist provinces and territories to develop offset programs that are compatible, and could eventually create transferable offset credits between Canadian jurisdictions.

ONTARIO'S CAP AND TRADE SYSTEM LIKELY MEETS THE FEDERAL REQUIREMENTS

These caps are for the entire Ontario economy, notwithstanding growth in industry and population. Ontario has one of the fastest growing populations in Canada. This means that GHG reductions per capita must drop even faster than the cap (see Figure 3.2).



Figure 3.2. Change in Ontario's GDP, Population and GHG Emissions since 1990.

Source: MOECC, "Climate Change Strategy".3

3.0.1 Is Carbon Pricing Bad For Growth?

The experience in Canada and in other parts of the world is that carbon pricing can be consistent with strong economic growth.

California's economy has grown strongly while both reducing absolute GHG emissions and experiencing population growth. According to the California Air Resources Board, "since 2010, California has created 2.3 million new jobs – outpacing most of the U.S. – cut its unemployment rate in half, eliminated a \$27 billion budget deficit and has seen its credit rating rise to the highest level in more than a decade. In 2016, California led the nation in job creation for the third straight year."⁴





Source: California Air Resources Board, News Release, "New Report Show California is Reducing Greenhouse Gas Emissions as Economy Continues to Grow", (07 June 2017).

Quebec has thrived since it began cap and trade. Quebec's first compliance period began January 1, 2013, and its program has been linked with California since January 1, 2014. Gross domestic product grew by 4.2% from 2013 to 2016.⁵ Meanwhile, Quebec allowance auctions raised over \$1.94 billion for the province's Green Fund. Some Green Fund investments have generated new export and employment opportunities. For example, an early Green Fund investment was to support the development of electric school buses. Today, the Lion Electric Company is pilot testing buses, developing electric trucks and planning a new manufacturing facility.⁶

British Columbia has also experienced economic growth since it adopted its carbon tax on July 1, 2008. Gross domestic product grew by 16% from 2008 to 2016.⁷ However, B.C. had originally pledged to increase its carbon tax by \$5 every year, but then froze the tax

at \$30/tonne in 2012. While the tax initially resulted in emissions reductions and fuel consumption reductions, after the tax freeze, B.C.'s total greenhouse gas emissions increased 2.7% from 2011 to 2014. Now it is unlikely the province will meet its legislated target of 33% reductions below 2007 levels by 2020.⁸ In its 2017 fall budget, the B.C. government announced it would resume the \$5/tonne annual increase to reach \$50/ tonne by 2021. B.C. is also revoking the original legal requirement that the carbon tax be revenue neutral.⁹

Alberta has two carbon pricing programs: the Specified Gas Emitters Regulation (SGER) since 2007 and a \$20/ tonne carbon levy on transportation and heating fuels since January 2017. The carbon levy will increase to \$30/tonne on January 1, 2018. The SGER requires emission intensity limits (tied to growth or unit output), not absolute caps, which means that the total amount of emissions allowed can increase as industrial output increases.¹⁰ The SGER was replaced with the Carbon Competitiveness Incentive (CCI) regulation in January 2018. When global crude oil prices collapsed in 2014, Alberta's oil-dependent economy felt the impact. The ECO has seen no evidence that the province's downturn was related to the SGER, and the carbon levy coincided with Alberta's economic recovery.¹¹

3.1 The Link with WCI (California/Quebec)

As indicated in Chapter 2, Ontario signed an agreement in September 2017 to formally link its cap and trade system with its Western Climate Initiative (WCI) partners, Quebec and California, in January 2018. The first joint auction is expected to take place in February 2018. A key principle of the linking agreement is that allowances issued, and offset credits recognized, in any one of the three jurisdictions may be used interchangeably for compliance purposes in the others. This means that all allowances will be pooled into one large WCI market and Ontario emitters may meet their compliance obligations under the *Climate Act* with WCI allowances and/or offsets from Ontario, California and/ or Quebec.

3.1.1 Why Link to a Larger Market

In *Facing Climate Change*, the ECO reviewed the rationale for the planned link. Compared to a standalone Ontario program (either cap and trade or a carbon tax) the link reduces costs for Ontario residents and businesses.¹² It also creates a bigger, more stable and more liquid market for allowances; and is an important building block for spreading carbon pricing across North America and beyond.

THE LINK REDUCES COSTS FOR ONTARIO RESIDENTS AND BUSINESSES

3.1.1.1 How Will the Link Reduce Costs for Ontarians?

Economic models predicted that, at least for the next few years, purchasing WCI allowances from outside Ontario would be less expensive for many Ontario emitters than reducing GHGs here. Generally, it is more expensive to reduce emissions in Ontario than in California, partly because we live in a colder climate, and partly because we already closed our coal-fired electric generating facilities. Taking coal out of the power sector is one of the cheapest options for big emissions reductions, and this is one that California is still working on.

A model commissioned by the Ontario Energy Board in March 2017 (before California updated their legislation) predicted the cost of Ontario allowances with and without the WCI link (see Figure 3.4). A second prediction by analysts in September 2017 (after California updated its legislation) is presented in Figure 3.5, with similar trends. Both predict that allowance prices will be close to the floor until after 2020.



Figure 3.4. Impact of linking to WCI market on the projected carbon price in Ontario. Without the link, the cost of cap and trade was predicted to start at over \$60/tonne in 2018. With the link, the cost per tonne is close to the WCI minimum floor price until after 2020.¹³

Source: Adapted from ICF, Long-Term Carbon Price Forecast Report (July 2017).



Figure 3.5. Projected carbon price scenarios to 2030. Prices anticipated to stay low until 2019 and then rise above the auction floor price after 2020.

Source: ClearBlue Markets, Market Fundamentals, with labels by the ECO.

The (predicted) lower cost per tonne of the WCI allowances means that everyday Ontarians will see less of an impact on every day expenses, from for example, housing heating bills, food and goods, and gasoline. A lower carbon price will also help to reduce leakage, the loss of trade-exposed industries and related GDP to other jurisdictions without carbon pricing. On the flip side, lower allowance prices do not send as strong a price signal to consumers. This could discourage behavioural change and related emissions reductions, and also decrease innovation and co-benefits (such as cleaner air) if reductions take place in other jurisdictions instead.

In addition, the link with WCI provides a larger market with increased liquidity which will improve the secondary market in Ontario. As Figure 3.6 shows, Ontario industries receive free allowances in annual lumps, up to nearly five years before they have to submit allowances equivalent to their emissions. This unusually long holding period (longer than in California or Quebec) creates a financial opportunity. Ontario industries could sell free allowances on the larger and

ONTARIO INDUSTRIES COULD SELL FREE ALLOWANCES TO RAISE CAPITAL TO FUND IN-PROVINCE EMISSIONS REDUCTIONS

more liquid WCI secondary market to raise capital to fund in-province emissions reductions. Carbon traders, such as some Canadian banks and pension funds, can purchase allowances from industries who have received them for free on the secondary market now, and resell them back to industry in 2021 when the compliance obligation matures. In the interim, industries can use the capital raised by selling their allowances to upgrade their buildings and equipment, reducing their emissions and the number of allowances they will later require. This creates financial incentives for both parties, and can create long-term GHG reductions in Ontario.



Figure 3.6. This image shows the timeframe for the free allocation of allowances and when compliance obligations come due across all three WCI jurisdictions. Bars above the line indicate allowances issued, bars below the line indicate compliance due dates. Unlike California, Ontario does not have annual "true-ups" where emitters must meet compliance obligations for 30% of their annual emissions. Ontario compliance obligations are not due until November 2021.

Source: Adapted from ClearBlue Markets, Compliance Timing Impact (Sept 2017).

3.1.1.2 Impact on People Who Buy Gasoline and Diesel Fuel

One of the features of Ontario's economy is that in Ontario, more than half of the allowances Ontario offers at auction are likely to be purchased by fossil fuel suppliers, who have little influence over the number of allowances they will require. In particular, petroleum product suppliers are likely to need to purchase between 60 – 70% of the allowances Ontario offers at auction in 2017 to 2020 (see Figure 3.7). Most of the petroleum products that these suppliers sell are used by their customers for transportation. This means that 60-70% of the cost of cap and trade likely will be passed on to consumers and businesses through the price of petroleum products. While these price signals are important to influence behaviour and reduce fuel consumption across the province, the initial cost 60-70% OF THE COST OF CAP AND TRADE LIKELY WILL BE PASSED ON THROUGH THE PRICE OF PETROLEUM PRODUCTS

savings from the linked market may ease the transition for Ontario drivers.

While exact numbers are not available, here is how the market might look in the first compliance period, if transportation fuel demand remains steady:



- Cap on Emissions (declines ~4% per year until 2020)
- Non-capped Sectors
- Allowances Placed in Strategic Reserve (5%)
- Free Allowances (declines ~3% each year)
- Auctioned Allowances
- Forecast of Fuel Suppliers' Purchases (% of Auctioned Allowances)

Figure 3.7. Distribution of allowances, showing that about 60-70% of available allowances are anticipated to be purchased by fuel suppliers. Not all of the capped allowances are available at auction: 5% is placed into the strategic reserve as a price control mechanism and about 24% is distributed free-of-charge to trade-exposed industries and institutions.

Petroleum product use resulted in about 61 Mt CO₂e in 2016. But, as shown in Chapter 2, many of the remaining sources of GHGs either do not require allowances (uncapped sectors, about 31 Mt), or will receive most or all of them for free. Large final emitters, institutions, and smaller companies who have opted in, emit about 35 – 45 Mt. In 2017, they will receive about 34 Mt or 24% of all allowances for free. The Ministry of the Environment and Climate Change expects the number of free allowances for combustion and process emissions given to industry to decline about 3% a year until 2020.¹⁴

Is it reasonable to expect transportation fuel demand to remain steady? Fossil fuel suppliers can and will pass through the extra cost of allowances as part of the price of their products to the ultimate customer; this may not, however, result in a commensurate reduction in gasoline consumption by individual drivers. Over the last several decades, gasoline prices have fluctuated dramatically without having much impact on overall consumer demand, as shown in Figure 3.8. The primary factors that affect consumer transportation demand, such as where they live, where they work, and what vehicle they drive, reflect big decisions that are somewhat locked-in and, therefore, difficult and expensive to change.

Allowance prices are more likely to affect diesel demand, as this is typically used by businesses, and therefore may be more cost sensitive. By linking with other WCI jurisdictions, the impact of the carbon price on fuel purchasers is less than it would be otherwise.



Figure 3.8. Volume of gasoline sold in Ontario compared to price. Prices have been relatively consistent since 2000 and not correlated with the volatile price of gasoline.

Source: CANSIM Table 134-0004, Supply and disposition of refined petroleum products. CANSIM Table 326-0009, Average retail prices for gasoline and fuel oil, by urban center.

3.1.1.3 How Will Ontario's Carbon Market Compare to the Pan-Canadian Framework Carbon Price?

The predicted price for linked allowances is generally lower than the Pan-Canadian Framework carbon price (see Figure 3.9).



Figure 3.9. Comparison of cap and trade price predictions to the Pan-Canadian Framework federal carbon price. Ontario has set three price thresholds at which the strategic reserve allowances are sold. These prices are set in relation to inflation and California's price thresholds and ceiling.

Source: ECO, using price prediction with WCI link from ICF, Long-Term Carbon Price Forecast Report (July 2017).

Because the Pan-Canadian Framework carbon tax will be much higher than the predicted price of WCI allowances, there would be a significant difference in costs for Ontarians and in revenues for Ontario, if Ontario switches from the WCI market to the Pan-Canadian Framework carbon tax. Analysts compared Ontario's current cap and trade policy with a revenueneutral Pan-Canadian Framework carbon tax scenario, assuming both would have similar assistance for trade-exposed large final emitters, and concluded: In terms of emissions reductions, cap and trade outperforms the Pan-Canadian Framework carbon tax. A higher carbon tax sends a stronger price signal to consumers and regulated entities in Ontario, but cap and trade has higher total GHG reductions due to the declining cap, offsets, WCI allowance imports, and using revenues to fund low carbon initiatives. 5

- Competitiveness and GDP impacts are similar.
- "policy lurching [i.e., switching from cap and trade to a carbon tax] will erode confidence and expectations... which undermines the price signal and cost-effectiveness."¹⁵

CAP AND TRADE OUTPERFORMS THE PAN-CANADIAN FRAMEWORK CARBON TAX

3.1.2 What Happened in California Since Last Year?

California is a world leader on climate policy, and has committed to reducing its GHGs to 40% below 1990 levels by 2030. This is an ambitious goal, more stringent than Ontario's own (37% below 1990 levels by 2030). On March 16, 2017, Governor Brown approved linkage of California's cap and trade program with Ontario's program. The Governor's approval paved the way for the linkage agreement that was signed on September 22, 2017.

California has reduced its GHG emissions through many mechanisms since adopting its *Global Warming Solutions Act* in 2006. According to the California Air Resources Board, between 20-30% of the expected reductions to 2020 and 38% from 2021 to 2030 will come from cap and trade; the remainder will come from other regulatory policies such as the Renewables Portfolio Standard, Advanced Clean Cars Program, and the Low Carbon Fuel Standard. Last year, we expressed concerns about whether California's cap and trade program would survive its litigation and legislative challenges long enough to reach the next decade. To California's credit, its cap and trade program not only survived, but triumphed over these challenges. The California Court of Appeal upheld the legal validity of the existing program to 2020.¹⁶ Despite a major constitutional barrier,¹⁷ California legally authorized its program to operate until 2030. Reauthorization was achieved on July 25, 2017 through two linked statutes:

- Assembly Bill 398 (AB 398), which amends the *California Global Warming Solutions Act* and extends California's cap and trade program to 2030; and
- Assembly Bill 617, which addresses environmental justice advocates' demands for better control of local emissions of criteria air pollutants and toxic air contaminants.

In addition, on July 27, 2017, the California Air Resources Board passed a resolution that adopted amendments to its cap and trade regulation that improved the management of surplus allowances. These are impressive and significant achievements, particularly given the current U.S. federal government.

California's new laws represent a hard-fought compromise between many competing interests. Some of the trade-offs included a price ceiling for allowances, plus a continued level of free allowances for industry,¹⁸ and limits on the use of offsets. For more information on California's new laws, see Appendices A and G, available online only at eco.on.ca). Politics in California had a significant impact on WCI auctions. When there was a risk that cap and trade would not continue in California, WCI auctions sold only 51% of current allowances and 25% of future vintages at the lowest possible price, the floor price. As soon as the political uncertainty was removed, markets picked up, selling 100% of current allowances from May to November 2017 with prices rising to 11% above the floor price.

CALIFORNIA'S CAP AND TRADE PROGRAM NOT ONLY SURVIVED, BUT TRIUMPHED



Figure 3.10. Price and auction sales in the WCI market.

Ontario's market may see similar trends with political uncertainty. See Chapter 2 for a full account of the Ontario auctions in 2017. Note that Ontario's floor price is set to match the floor price between Quebec and California and is calculated in Canadian dollars (CAD) based on the exchange rate on the day of the auction. This means the floor price can fluctuate due to changes in the Canadian/U.S. exchange rate.



Figure 3.11. Price and auction sales in the Ontario market. The prices fluctuate in Canadian dollars due to the exchange rate.

3.2 Outlook for Ontario's Carbon Market to 2030

Market systems like cap and trade are not perfectly predictable. There are many reasons for uncertainty, including fluctuations in economic activity and allowance demand, policy uncertainty, prices for fossil fuel products, as well as a lack of accurate and timely emissions data.

A simple forecast of Ontario's future demand for allowances compared to Ontario's emissions cap is shown below in Figure 3.12.



Figure 3.12. Forecast of Ontario's future demand for allowances compared to the available allowances and credits. Figure assumes demand (emissions under the cap) will decrease at approximately 1% per year, based on average 1.2% decline from 2012-2015 and an estimate for early reduction credits based on Quebec's experience.

3.2.1 Will Money Flow From Ontario to California?

No one knows with certainty how many WCI allowances Ontario emitters will choose to buy beyond the amount that Ontario auctions. Capped emitters have at least three options: reduce emissions, buy allowances, or buy offsets. The best we can do is make educated forecasts about future supply and demand. This will become easier to answer when Ontario releases 2016 emissions data, which will include emissions reported by fuel suppliers.¹⁹ Other factors include how much credit Ontario will give for early reductions, how Ontario manages its reserve over time and how Ontario rolls out its offsets policy.

Ontario emitters may not need to purchase any allowances from outside Ontario until after 2020, if

ONTARIO EMITTERS MAY NOT NEED TO PURCHASE ANY ALLOWANCES FROM OUTSIDE ONTARIO UNTIL AFTER 2020

they make full use of their right to use offset credits for up to 8% of their compliance obligations (see Figure 3.13). This is significantly less demand than had been previously expected (as discussed in the ECO's 2016 report *Facing Climate Change*).



Figure 3.13. Cumulative balance of Ontario's allowance supply and demand. Figure shows that Ontario may have excess allowances until 2022 to 2025, depending on demand and the amount of offsets purchased. Figure is based on assumptions in Figure 3.12.

Source: Analysis by the ECO, adapted from ClearBlue Markets.

In part, the smaller predicted need for allowances from outside Ontario is because natural gas consumption in Ontario dropped in the first half of 2017 compared to the same time period in 2016, due partly to the mild winter and relatively cool summer. Ontario gas distributors had predicted that they would need to purchase 37 M allowances for 2017,²⁰ but natural gas deliveries in Ontario from gas distributors were down 5% year over year in November 2017, compared to 2016. Natural gas demand for electricity generation was down an impressive 59% in the first half of 2017.²¹

Second, as indicated above, Ontario industries may be able to use the long time period while they hold free allowances to finance emissions reductions in their operations. This is the trend observed in California, Quebec, and the European Union Emissions Trading System (EU ETS): once a price was put on carbon, industries started to make changes to avoid the annual cost of purchasing allowances each year.

Third, Ontario emitters may have good financial reason to maximize their use of offset credits instead of purchasing additional allowances. The WCI Linking Agreement requires Ontario to accept offset credits registered in California or Quebec. California has registered, and recognized, a significant number of offset credits for projects outside California. California's new legislation reduced the amount of offset credits California emitters can use for compliance purposes from 8% to 4% from 2021 to 2025 and 6% from 2026 to 2030. Since the law requires that at least half of these offsets provide direct environmental benefits within the state, there could be a surplus of offset credits already recognized by California that were created elsewhere in the U.S.²² These offset credits are now eligible for use in Ontario, and the reduction in California demand may keep their price comparatively low. Ontario's current offset regulation has no similar requirement that Ontario emitters use offsets that benefit Ontario (see Chapter 4 for more details on offsets).

Future Ontario demand may be further reduced by new low-carbon policies, for example, the upcoming federal Clean Fuel Standard.

Overall, it cannot yet be determined how much money may flow between jurisdictions, but it is likely to be less than previously anticipated.

FUTURE ONTARIO DEMAND MAY BE FURTHER REDUCED BY NEW LOW-CARBON POLICIES

A DISPROPORTIONATE OVERSUPPLY OF ALLOWANCES CAN CAUSE MANY PROBLEMS



3.3 How Will Ontario Do in the WCI Carbon Market?

A simple forecast of the WCI market (presented in Appendix G, available online only at eco.on.ca) suggests that both California and Quebec are currently oversupplied with allowances. That is, they both have surplus allowances, or more supply than demand, but the oversupply is much larger in California. A disproportionate oversupply of allowances can cause many problems, such as:

- keeping carbon prices so low, and future supply of allowances so abundant, that jurisdictions could be unable to meet their long-term GHG-reduction targets; and,
- distorting the distribution of revenues among jurisdictions (i.e., a large oversupply of allowances in California could mean that the WCI revenue distribution would favour California, with a greater proportion of pooled revenues flowing from Ontario and Quebec to California in future auctions).

California is required by law to address its oversupply. It has already taken some steps, e.g., transferring some unsold allowances into its strategic reserve (the Allowance Price Containment Reserve, or APCR) and limiting when unsold allowances can be auctioned again (see Appendices B and G, available online only at eco. on.ca). Ways to reduce oversupply include lowering future caps, moving surplus allowances to the reserve and/ or fully retiring some surplus allowances. Ontario also has provisions that limit when unsold allowances can be auctioned again, but does not yet have a mechanism to transfer unsold allowances to the reserve or to retire oversupply. The Regional Greenhouse Gas Initiative in the northeastern United States has effectively reduced its oversupply by reducing future caps (see Section 3.5.1.1).

Reducing oversupply is likely to cause WCI prices to rise above the floor price sooner, but WCI prices are still likely to be significantly lower than the federal Pan-Canadian Framework carbon price. Ontario will continue to benefit from linking due to this lower cost and to the increased liquidity and stability of the larger, shared market. To fine-tune the linked program and to avoid the risk of an unnecessary flow of funds from Ontario to California, the ECO recommends that:

The government should work with California and Quebec to reduce the oversupply of allowances, and to adjust future caps and allowance supply as needed to meet GHG-reduction targets.

3.4 Can Ontario Count U.S. Allowances Towards Targets?

One feature of the Pan-Canadian Framework is a shared assumption that Canada, Ontario and Quebec will be able to achieve greenhouse gas (GHG) reductions by buying allowances from outside Ontario. Figure 3.14 shows the proposed pathway to achieve Canada's 2030 climate target which includes international imports of allowances. These estimates assume the "purchase of carbon credits from California by regulated entities under Quebec and Ontario's capand-trade system that are or will be linked through the Western Climate Initiative."²³





Source: Pathway to Meeting Canada's 2030 Target. Pan-Canadian Framework on Clean Growth and Climate Change, page 45.

This assumption may not be correct. To date there is no clear legal basis for Ontario, or Canada, to claim reductions that may have occurred in California as part of their GHG inventory, as explained in Section 3.4.1.

3.4.1 The U.S., the Paris Agreement and Article 6

How could Ontario, and Canada, claim reductions here that actually occurred in another country? As we cautioned in *Facing Climate Change*:

HOW COULD ONTARIO, AND CANADA, CLAIM REDUCTIONS HERE THAT ACTUALLY OCCURRED IN ANOTHER COUNTRY?

At present, GHG reductions achieved outside the province but claimed for compliance by Ontario emitters would not count towards Ontario's emissions total or international targets. However, the Paris Agreement, agreed to at the December 2015 United Nations climate change conference, created an enabling framework which could allow Ontario to use emissions reductions achieved outside Canada towards its own targets, if the Canadian government successfully negotiates an appropriate bilateral agreement with the United States [emphasis added]. For Ontario to count California allowances to reduce Ontario's emissions in the international system, it will need the federal government to negotiate such an agreement with the U.S.

Article 6 of the Paris Agreement, which Canada cofacilitated, created the enabling framework for this mechanism, i.e., for countries to meet part of their GHG-reduction obligations by funding reductions in other countries. The mechanism is known as International Transfer of Mitigation Obligations. This mechanism may support the use of transfers under the Western Climate Initiative towards Canada's Nationally Determined Contribution. However, on June 1, 2017, the U.S. federal government announced that the United States would withdraw from the Paris Agreement.²⁴ This will leave the U.S. as the only country in the world that is not a party to the Paris Agreement. Fortunately, other U.S. actors, including more than 1,400 states, cities, businesses, and organizations, announced that they would achieve the U.S.'s Paris pledge, with or without the federal government.

Without American federal participation, it will be difficult to obtain a national government-to-government agreement for the international transfer of mitigation obligations, as contemplated by Article 6 of the Paris Agreement. However, it is possible that the procedures to be adopted under the Paris Agreement will permit trades of mitigation obligations between subnational jurisdictions, and not merely between countries. It is also possible that U.S. consent will be unnecessary if it withdraws from the Agreement.

This is one of the topics that was discussed at the 23rd Conference of the Parties (COP 23) in November 2017. COP 23 is a world meeting of countries who are parties to the Framework Convention on Climate Change, and to the Paris Agreement. One task at COP 23 was to develop "guidance," "rules, modalities and procedures" and a work program to implement Article 6. Such procedures will have to specify how to reliably calculate emissions reductions in one jurisdiction that are to be transferred to the purchasing jurisdiction, i.e., Ontario, and the timing of such reductions.

Since some countries, especially in the developing world, have low-cost opportunities for GHG reductions, an Article 6 mechanism could significantly reduce the cost of global emissions reductions. However, it is critical that any such reductions are high quality and credible, and do not repeat some abuses that occurred with the Clean Development Mechanism.²⁵

CARBON TAXES AND CARBON MARKETS ARE EXPECTED TO RAISE \$52 BILLION GLOBALLY IN 2017



3.5 Carbon Pricing Spreading Around the World

In addition to reducing the cost of compliance for Ontario emitters, another significant rationale for linking with California and Quebec is to promote the spread of carbon pricing across jurisdictions. It is encouraging to see how rapidly carbon pricing is spreading around the world, and becoming increasingly ambitious, in both developed and developing nations. In part, this is because carbon pricing is receiving widespread business support. Business groups were strong supporters of extending California's cap and trade system to 2030. Several provinces, including Ontario, are members of the multi-stakeholder Carbon Pricing Leadership Coalition, a "voluntary partnership of national and sub-national governments, businesses, and civil society organizations that agree to advance the carbon pricing agenda by working with each other towards the long-term objective of a carbon price applied throughout the global economy."²⁶

According to the World Bank, 15% of global GHG emissions are now covered by a carbon price. In total, carbon taxes and carbon markets are expected to raise \$52 billion in 2017, up 7% from 2016. The number of carbon pricing schemes in place or scheduled is now 46; this has quadrupled since 2007 and almost doubled in the last 5 years.²⁷



Figure 3.15. Map of carbon pricing initiatives around the world.

Source: International Emissions Trading Association Global Carbon Pricing Map (December 2017).

3.5.1 Global Examples

Here are some examples of new or growing carbon pricing systems in the last year.

3.5.1.1 Regional Greenhouse Gas Initiative

North America's first cap and trade program, the Regional Greenhouse Gas Initiative (RGGI), governs the electric power sector in nine northeast American states: Vermont, Rhode Island, New Hampshire, Maine, Delaware, Connecticut, Maryland, Massachusetts and New York (New Jersey participated from 2009 through 2011). By 2014, RGGI had contributed to a 45% drop in GHG emissions from this sector since 2005;²⁸ since then, another coal-fired plant has closed. In total, GHGs have dropped twice as fast in the RGGI states as in the rest of the United States. Air pollution has also been slashed, producing an estimated \$5.7 billion in health savings and other benefits.²⁹ Every participating state has reportedly experienced health and economic benefits from this cleaner air; downwind states also benefit.

In addition, reinvestment of RGGI revenues has produced its own economic benefits. In its second compliance period, 2012-2014, RGGI raised about \$1 billion. Reinvestment of this money added \$1.3 billion in economic value to the nine RGGI states, led to the NORTH AMERICA'S FIRST CAP AND TRADE PROGRAM, RGGI, HAS PRODUCED \$5.7 BILLION IN HEALTH SAVINGS AND OTHER BENEFITS

creation of more than 14,000 new jobs, and cut electricity and heating bills, saving consumers \$460 million.³⁰

RGGI states, both Republican and Democrat, have recently agreed to make the program more ambitious, and to cut the total cap on allowances another 30% by 2030. In addition, RGGI now has two provisions to minimize surplus allowances and to support allowance prices:

- The accumulated bank of issued but unused allowances, as of December 31, 2020, will be wiped out over five years, by proportionately reducing the new allowances offered at auction in each of these years.
- 2. If allowance prices at auction fall below a *soft floor*, up to 10% of the allowances scheduled for sale at that auction will be cancelled.



^{2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020}

Figure 3.16. RGGI has reduced its cap as an adjustment for oversupply or "banked" allowances.

Source: U.S. Department of Energy, Energy Information Administration $^{\rm 31}$



There is now a second example of linking across jurisdictions, in addition to the WCI. After years of negotiations, the European Union and Switzerland have agreed to link their respective emissions trading systems (ETS). Switzerland will be the first linking partner of the EU ETS.

The EU ETS faces a similar issue of oversupply, in part due to economic downturn in 2008, with over 2 billion tonnes of banked surplus allowances and low carbon prices. The EU recently agreed to remove 24% of the surplus to the Market Stability Reserve each year if the market surplus exceeds 833 million allowances (enough to cover the annual emissions of the whole German economy). Additionally, if the number of allowances in the reserve exceeds the number auctioned in the previous year, then the excess will be automatically and permanently removed from the market.³²

3.5.1.3 Mexico

In August 2016, Ontario and Quebec signed a joint declaration with Mexico to work on developing carbon markets, with the eventual goal to see Mexico join the WCI market. Mexico started to trade simulated emissions permits in 2017 ahead of a national carbon market in 2018.

3.5.1.4 China

China is expected to announce its first national cap and trade program soon, as part of its ambitious Green Financial System.³³ The announcement was expected in late December 2017. China's national carbon market will be, by far, the world's largest and is expected to cover thousands of entities and will cover about a quarter of the country's emissions. They will start with three major emitting sectors: electricity, aluminum and cement. China has also established a domestic offset mechanism.

CHINA'S NATIONAL CARBON MARKET WILL BE, BY FAR, THE WORLD'S LARGEST



3.5.1.5 Korea

Korea has had a national carbon market since 2015, and is moving into the second phase in 2018. The major challenge in this ETS has been high demand for carbon allowances and limited supply,³⁴ which pushed carbon prices to all-time highs in November 2017. The focus of Phase II is to incent emitters to invest more in emissions reductions. For example, about half the allowance allocations will now be based on industry benchmarks for GHG efficiency, instead of on historical emissions.

3.5.1.6 New Zealand

New Zealand's cap and trade system is becoming more stringent, to move towards its 2030 target to reduce greenhouse gas emissions to 30% below 2005 levels.³⁵ Originally, participants in the New Zealand ETS were required to surrender one emission unit for every two tonnes of carbon dioxide equivalent emissions. This one-for-two ratio is being phased out. The old 50% surrender obligation increased to 67% in January 2017, and will increase to 83% in January 2018, and to 100% in January 2019.

3.5.2 International Aviation

Another significant innovation in worldwide carbon pricing is the rapid development of a cap and trade system for international aviation. By September 2017, 72 countries representing 88% of international aviation activity had registered with the International Civil Aviation Organization their intention to participate in the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA). CORSIA will allow airlines to offset the growth in their GHGs from international aviation by purchasing offsets.³⁶

3.6 Conclusions and Recommendations

Well designed cap and trade systems have proven to be environmentally effective and cost effective. Ontario is joining a best-in-class cap and trade system with the WCI and it should provide significant benefits for Ontario.

The WCI program does have a few technical details that should be "tuned up" moving forward, including addressing oversupply and ensuring the integrity of offsets. Addressing these issues will maintain the integrity of the cap, which provides the key benefit of cap and trade.

The government should work with California and Quebec to reduce the oversupply of allowances, and to adjust future caps and allowance supply as needed to meet GHG-reduction targets.

Given that the WCI market is currently oversupplied, it is important to invest the cap and trade proceeds wisely to encourage further reductions in Ontario. This will help Ontario keep a larger share of WCI revenues in Ontario while supporting Ontario's transition to a low carbon economy (see Chapter 5 for further recommendations on the GGRA spending). ONTARIO IS JOINING A BEST-IN-CLASS CAP AND TRADE SYSTEM WITH THE WCI

Endnotes

- The Conference Board of Canada, *The Cost of a Cleaner Future:* Examining the Economic Impacts of Reducing GHG Emissions (Ottawa: The Conference Board of Canada, 2017) at 21. This 40Mt estimate is based on a \$10 increase each year to 2025. This projection is in broad agreement with modelling from other groups, e.g. EnviroEconomics that project a 47 Mt reduction by 2030 from an annually increasing \$10/tonne carbon price, see EnviroEconomics, A Note on the Implications of the Federal GHG Price Backstop by Dave Sawyer and Chris Bataille (October 2016), Online: <drive.google.com/file/ d/0B9FT5KrVwYmwamlsWIFPd1JKMIU/view>
- Government of Canada, Pan-Canadian Framework on Clean Growth and Climate Change, Annex I: Federal Investments and Measures to Support the Transition to a Low-Carbon Economy (Ottawa, 2016) at 47, online: https://www.canada.ca/en/services/environment/weather/climatechange/pancanadian-framework/annex-federal-investments-measures.html
- "Climate Change Strategy", online: MOECC, <<u>https://www.ontario.ca/page/climate-change-strategy</u>> [Accessed 15 Dec 2017]
- "New Report Shows California is Reducing Greenhouse Gas Emissions as Economy Continues to Grow", online: CARB <<u>https://arb.ca.gov/newsrel/newsrelease.php?id=933</u>>(June 7, 2017)
- Quebec's GDP (final domestic demand, 2007 constant prices) went from \$329B in 2013 to \$343B in 2016. "Gross domestic product, expenditurebased, provincial and territorial," online: Statistics Canada CANSIM Table 384-0038 <<u>www5.statcan.gc.ca/cansim/a47</u>>
- 6. "Medias," online:The Lion Electric Company: <<u>https://thelionelectric.</u> <u>com/en/medias></u>
- BC's GDP (final domestic demand, 2007 constant prices) went from \$213B in 2008 to \$248B in 2016. "Gross domestic product, expenditurebased, provincial and territorial," online Statistics Canada CANSIM Table 384-0038 <<u>http://www5.statcan.gc.ca/cansim/a47</u>>
- 8. The extent to which the carbon tax has succeeded in reducing overall emissions in the province is less clear. Most of the increases in recent years is attributable to the growth of the liquefied natural gas industry in the province, and B.C. has openly admitted that it will not meet its 2020 GHG-reduction target. See British Columbia, "Provincial Greenhouse Gas Inventory" online: https://www2.gov.bc.ca/gov/content/environment/climate-change/data/provinical-inventory [Accessed October 19 2017] and "Trends in Greenhouse Gas Emissions in B.C. (1990-2014)," online: Government of B.C. https://www.env.gov.bc.ca/soe/indicators/sustainability/ghg-emissions.html
- "Budget 2017 Update," online: Government of B.C. <<u>http://bcbudget.gov.bc.ca/2017_Sept_Update/bfp/2017_Sept_Update_Budget_and_Fiscal_Plan.pdf#TaxMeasures></u>
- 10. Alberta's Specified Gas Emitters Regulation applies to facilities releasing more than 100,000 tonnes per year.
- 11. TD Economics, *Alberta's Recession Not Quite Like the Others*, by TD Bank Group (July 2016), online: <<u>www.td.com/document/PDF/</u> <u>economics/special/AlbertaRecession2016.pdf</u>>
- 12. Dave Sawyer, "A Better Trade-Off Analysis of Ontario Carbon Pricing Choice" EnviroEconomics(December 2017), online: <<u>www.</u> <u>enviroeconomics.org/single-post/2017/12/04/A-better-trade-off-</u> <u>analysis-of-Ontario-Carbon-Pricing-choices></u>

- Ontario Energy Board, Long-Term Carbon Price Forecast Report by ICF (July 2017) at 4. Online: <<u>www.oeb.ca/sites/default/files/uploads/OEB-LTCPF-Report-20170531.pdf</u>>
- 14. The overall reduction in free allowances by 3% per year is an estimate including both combustion and process loads, according to communication with MOECC. The number of free allowances for combustion emissions will decline at a rate of 4.57% per year for combustion emissions starting in 2018, see, "Cap and Trade: Program Overview", online: MOECC <wac here two www.ontario.ca/page/cap-and-trade-program-overview#section-3>
- Dave Sawyer, "A Better Trade-Off Analysis of Ontario Carbon Pricing Choice" EnviroEconomics(December 2017), Online: <<u>www.</u> <u>enviroeconomics.org/single-post/2017/12/04/A-better-trade-off-</u> <u>analysis-of-Ontario-Carbon-Pricing-choices></u>
- California Chamber of Commerce, et al v California Air Resources Board, et al, Case No. C075930 (Cal Ct App 3d Dist, 2017), online: <u>http://www. courts.ca.gov/opinions/archive/C075930.PDF</u>. [Accessed October 19 2017]
- The constitutional challenge was created by Proposition 26 which, in effect, required a two thirds majority in both of California's legislative assemblies.
- 18. The cap adjustment factor declines at a faster rate after 2020 and, by 2030, most industrial sectors will receive less than 50% of the allowances they need to cover their compliance obligations for free. California Air Resources Board, Cap-and-Trade Regulation
- 19. Unlike California, Ontario does not publish complete data for compliance entities' demand for allowances. While reported annual emissions of the large final emitters are published in the fall of the subsequent year, these organizations release less than a third of Ontario emissions, and constitute a comparatively small proportion of the demand for allowances at auction.
- Ontario Energy Board, Decision and Order EB-2016-0296 / EB-2016-0300 / EB-2016-0330, Union Gas Limited and Enbridge Gas Distribution Inc and Natural Resource Gas Limited: Applications for Approval of 2017 Cap and Trade Compliance Plan Cost Consequences (September 21, 2017) at 19, online:www.rds.oeb.ca/HPECMWebDrawer/ Record/584372/File/document>. [Accessed October 19, 2017]
- Comparison of 2017 to 2017 Natural Gas generator output from January to October. "Generator Output by Fuel Type Monthly Report: For 2016", online: IESO <reports.ieso.ca/public/GenOutputbyFuelMonthly/ PUB_GenOutputbyFuelMonthly_2016_v14.xml#> and "Generator Output by Fuel Type Monthly Report: For 2017", online: IESO <reports.ieso.ca/ public/GenOutputbyFuelMonthly/PUB_GenOutputbyFuelMonthly_2017_ v10.xml>
- 22. Some analysts predict there will be a shortage of Californian offsets in future. California Carbon predicts the supply of in-state offsets would meet no more that 0.4% of the compliance demand over the 2021–2030 period in "An Impact Analysis of AB398 on California's Cap-and-Trade Market", online: California Carbon <<u>californiacarbon.info/wp-content/</u><u>uploads/2017/07/AB398-_Impact_Analysis.pdf</u>>

3

- Government of Canada, Pan-Canadian Framework on Clean Growth and Climate Change (2016) at 45, online: <u>https://www.canada.ca/en/services/ environment/weather/climatechange/pan-canadian-framework.html</u>. [Accessed October 19, 2017]
- 24. This and other actions by President Trump, including radical cuts to the Environmental Protection Agency and to scientific research, put into jeopardy the success of global efforts to combat climate change.
- 25. See Chapter 4 of this report which discusses Offsets.
- 26. "Leadership Coalition," online: Carbon Pricing Leadership Coalition https://www.carbonpricingleadership.org/leadership-coalition/
- 27. World Bank Group and Ecofys. Carbon Pricing Watch 2017: An Advance Brief From the "State and Trends of Carbon Pricing 2017" Report, p.2. https://www.ecofys.com/files/files/world-bank-ecofys-carbon-pricingwatch-2017.pdf
- "The Investment of RGGI Proceeds in 2015", online: The Regional Greenhouse Gas Initiative <<u>www.rggi.org/docs/ProceedsReport/RGGI</u> <u>Proceeds_Report_2015.pdf</u>>
- 29. "Regional Greenhouse Gas Initiative Improves Health, Saves Lives, and Generates %5.7 Billion in Benefits," online: Abt Associates <abtassociates.com/NewsReleases/2017/RGGI-Improves-Health.-Saves-Lives,-and-Generates-\$.aspx>
- 30. "The Economic Impacts of the Regional Greenhouse Gas Initiative on Nine Northeast and Mid-Atlantic States," online: Analysis Group <<u>www.</u> analysisgroup.com/news-and-events/news/energy-report--states-thatlimit-carbon-emissions-through-markets-see-economic-benefits/ >
- "Regional Greenhouse Gas Initiative auction prices are the lowest since 2014", online: U.S. Energy Information Administration, <<u>www.eia.gov/</u> todayinenergy/detail.php?id=31432&src=email>
- 32. "Q&A: Will the reformed EU Emissions Trading System raise carbon prices?", CarbonBrief by Simon Evans, online: <<u>www.carbonbrief.org/</u> <u>qa-will-reformed-eu-emissions-trading-system-raise-carbon-prices></u>
- "Establishment of China's Green Financial System," online: The Peoples' Bank of China <<u>www.cbd.int/financial/privatesector/china-Green%20</u> <u>Task%20Force%20Report.pdf</u>>
- 34. "Republic of Korea" An Emissions Trading Case Study," online: International Emissions Trading Association <www.ieta.org/ resources/2016%20Case%20Studies/Korean_Case_Study_2016. pdf>and "After two years, S. Korea's carbon trading market stopped, without trade," online: The Hankyoreh <<u>english.hani.co.kr/arti/english</u> <u>edition/e_national/789613.html></u>
- "About the NZ ETS review 2015/16," online: New Zealand Government <www.mfe.govt.nz/nzets/about-nz-ets-review>; <www.mfe.govt.nz/ climate-change/reducing-greenhouse-gas-emissions/new-zealandemissions-trading-scheme/legislative>
- 36. Domestic aviation emissions are already captured by countries' domestic carbon inventories, and therefore by domestic carbon pricing/ regulatory systems. "Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA)," online: International Civil Aviation Organization <<u>www.icao.int/environmental-protection/Pages/marketbased-measures.aspx</u>>

Chapter 4 Carbon Offsets

A reduction in GHG emissions outside the cap, to make up for extra emissions by capped emitters

Abstract

Ontario has a cap and trade system for reducing greenhouse gas (GHG) emissions. About 82% of Ontario's GHG emissions are covered by the cap. The cap is expected to drive up the cost of fossil fuels.

What is an offset credit?

To moderate the cost increase, Ontario allows capped emitters, including the fuel suppliers that most Ontarians depend on, to buy offset credits. Offset credits can allow capped emitters to pay for cheaper GHG emissions reductions in sectors outside the cap, instead of spending more on allowances or to reduce their own emissions.

Offsets could therefore help Ontario reach its GHG targets while improving the wellbeing of Ontarians and our environment. But offsets have many potential pitfalls. If they are not done right, they can be little more than greenwashing. Not all offset protocols accepted by our Quebec and California partners are based on adequate evidence of effectiveness. Ontario should only authorize offset protocols that will result in reductions that are real, quantifiable, additional, permanent, verifiable, and adequately assessed for leakage.

Carbon Offsets

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ONTARIO ALLOWS CAPPED EMITTERS TO USE OFFSET CREDITS TO MEET UP TO 8% OF THEIR COMPLIANCE OBLIGATIONS

4.0 Who Needs Offsets? We All Do

Ontario's cap and trade program is designed to help the province reach its emissions-reduction targets under the *Climate Change Mitigation and Low-carbon Economy Act, 2016* (the "*Climate Act*"). Capped emitters will have to submit compliance instruments, such as allowances and offset credits, for every tonne of GHGs that they emit.

As shown in Chapter 1, over half of Ontario's GHG emissions come from natural gas, gasoline, and diesel fuel used for everyday transportation, and to heat homes, schools, stores, and other buildings. The fuel distributors who supply these fuels to people and businesses around the province are expected to buy most of the allowances sold in the first compliance period, from 2017 to 2020.¹ They need these allowances so they can meet fuel demand from Ontarians (see Chapter 3). The cap on allowances, together with a steadily rising floor price for allowances, is expected to drive up the cost of using fossil fuels. To moderate the cost increase, Ontario allows capped emitters, including fuel distributors, to use offset credits to meet up to 8% of their compliance obligations.

Offset credits can sometimes be cheaper than buying allowances or reducing fossil fuel use. In these cases, offset credits can help keep *Climate Act* compliance costs down for Ontario businesses, and for everyone who directly or indirectly uses fossil fuels (i.e., all of us). Offset credits can also help reduce GHGs from uncapped sectors such as agriculture, waste and forestry.



How Cap and Trade Works for a Fuel Distributor

Figure 4.1. Offset credits are one compliance mechanism that allow capped emitters to meet their obligations under cap and trade.

Source: Environmental Commissioner of Ontario.
4.1 What Are Offsets?

Offset projects² either: reduce GHG emissions in sectors that are not covered by the cap, or *sequester* GHGs by pulling them out of the atmosphere and putting them into safe storage. In principle, every tonne of GHGs reduced or removed by an offset project makes room in the atmosphere for a capped emitter to release an extra tonne of GHGs, without increasing the total level of Ontario emissions. The GHGs reduced or removed by an offset project are measured in offset credits (sometimes referred to simply as *offsets*), which capped emitters can buy to *cancel out* (i.e., *offset*) up to 8% of their emissions.

For example, Ontario's sewage treatment plants³ are not required to capture the potent GHG, methane, which is released during treatment. Because sewage treatment plants are not capped emitters, a sewage plant that captures and destroys its methane emissions (or uses them for renewable fuel) may be eligible to earn offset credits for each tonne of carbon dioxide equivalent (CO_2e) captured if it meets an approved quantification protocol. The plant could sell such offset credits to capped emitters, who can use them to offset some of their own GHGs. In other words, capped emitters will be able to emit more GHGs than the cap, by paying for emissions from uncapped emitters to go down by the same amount. EVERY TONNE OF GHGS REDUCED OR REMOVED BY AN OFFSET PROJECT MAKES ROOM IN THE ATMOSPHERE FOR A CAPPED EMITTER TO RELEASE AN EXTRA TONNE OF GHGS



Figure 4.2. Reductions in uncapped emissions from offset projects help capped emitters comply with the cap. Capped emitters can reduce fewer emissions, or purchase fewer allowances, and still satisfy their compliance obligations (diagram not to scale).

Source: Environmental Commissioner of Ontario.

4.2 Why Include Offsets in Ontario's Cap and Trade Program?

4.2.1 Offsets Can Reduce Costs for Capped Emitters

Buying offset credits may be a quick and cost-effective way for capped emitters to meet part of their cap and trade compliance obligations.⁴ Internal emissions reductions can take years to materialize at scale, since they often require government approvals as well as significant investment in technology, equipment, and capital stock. Offsetting can deliver lower-cost emissions reductions for the near term, and can act as a bridge to higher levels of emissions reductions in the future.

By offering a lower cost and timely alternative to other compliance options, offsets can help reduce the risk of carbon leakage (i.e., the movement of businesses BUYING OFFSET CREDITS MAY BE A QUICK AND COST-EFFECTIVE WAY FOR CAPPED EMITTERS TO MEET PART OF THEIR COMPLIANCE OBLIGATIONS

out of Ontario to jurisdictions with less stringent carbon policies), and allow facilities to choose GHG-reduction strategies that work with their business plans and budgets. For instance, a company that requires time to purchase and install lower-emissions equipment may wish to buy offsets in the short term, rather than forcing reductions or purchasing allowances at a potentially higher price.

OFFSETS CAN HELP REDUCE THE RISK OF CARBON LEAKAGE



Figure 4.3. Offsets can act as a safety valve or buffer for capped emitters who cannot obtain enough allowances to cover all their emissions. And because offsets can cost less than allowances or reductions, access to offsets may reduce the cost of compliance.

Source: Environmental Commissioner of Ontario.

4.2.2 Offsets Can Expand the Reach of Cap and Trade

Including offsets in cap and trade can expand the reach of emissions reductions. Under Ontario's cap and trade system, offset credits will only be generated by reductions in emissions from uncapped sectors such as agriculture, waste and forestry. Although the fossil fuels used to power equipment and buildings in these sectors are covered by the cap (through their fuel distributors), the other GHGs generated by these sectors - such as from fertilizer use, and decomposition of organic waste and logging debris - are not. These processes tend to release potent GHGs, such as methane and nitrous oxide. Together, waste management and agriculture account for over 85% of Ontario's methane emissions⁵ and 69% of the province's nitrous oxide emissions.⁶ Even in small amounts, these gases do outsized climate damage.7

OFFSETS COULD CREATE AN INCENTIVE TO CUT METHANE AND NITROUS OXIDE EMISSIONS FROM AGRICULTURE, WASTE AND FORESTRY

Since uncapped emissions that offsets reduce are, by definition, uncapped, they can legally continue to grow. Offsets could create a source of funding, and therefore an incentive, to cut methane and nitrous oxide emissions from agriculture, waste and forestry that would otherwise continue to be emitted, unaffected by the cap.



Photo credit: Shutterstock, 2018.

Photo credit: Shutterstock, 2018.

Regulate or Incent?

Regulators must often choose between mandating pollution reduction, i.e. by regulation, or *incenting* pollution reduction with an economic instrument, such as an offset credit. There can be good reasons for either approach, and they can be effectively used one after the other. For example, California offers offset credits and other incentives for improved dairy methane capture until 2024, when dairy methane capture is expected to become mandatory. This on-ramp provides several years of low-cost offsets for capped emitters while reducing the financial burden of methane capture for farmers who are willing to reduce their emissions early, improving the acceptability of emissions reductions for both groups.

4.2.3 Offset Projects Can Produce Environmental and Socio-Economic Co-Benefits

Offset projects may produce local environmental and socio-economic co-benefits. For instance, reducing the excess use of nitrogen fertilizers on Ontario farms could lower GHGs while improving water quality in Ontario's lakes by reducing nitrogen run-off. And many types of offset projects can provide jobs for community members, improved air quality and associated respiratory health outcomes, and/or recreational opportunities, thereby contributing to healthy and sustainable communities where Ontarians live, work and play.



Figure 4.4. Environmental and community co-benefits from offset programs.

Source: Ministry of the Environment and Climate Change, "Developing a Voluntary Carbon Offsets Program for Ontario: Discussion Paper" (2017).

4.2.4 Helping Rural and Remote **Communities**

Ontario's offset program could bring benefits to the rural and remote communities where many offset projects may be located. These same regions may be disproportionately affected by fuel price increases associated with cap and trade.8 As a result, Ontario's proposed offset program could help to relieve some of the financial burden felt by rural and remote communities, who are not primarily responsible for Ontario's GHG emissions.9

ONTARIO'S OFFSET PROGRAM **COULD BRING BENEFITS TO RURAL** AND REMOTE COMMUNITIES

Voluntary Offsets – Also Important, But Different

Most of this chapter focuses on offset credits that can be used as compliance instruments to meet capped emitters' obligations under the Climate Act. This is not the only type of offset. Voluntary offsets are not used for compliance, and are bought and sold on a separate voluntary carbon market (for more discussion of carbon markets, see Appendix B, available online only at eco.on.ca).

Voluntary offset credits have no special legal status and are not regulated by the province. Because of this, voluntary offsets can be more flexible than compliance instruments,¹⁰ and are often less expensive.¹¹ Unlike compliance offsets, which must meet regulatory standards, there is a great deal of variability in the quality of voluntary offsets.

Many organizations and institutions purchase voluntary offsets to boost their reputation and for corporate leadership.¹² Purchasing offsets allows companies and organizations to promise their customers, their investors and/or their employees that their operations are carbon neutral.

To give these promises credibility, the International Carbon Reduction and Offset Alliance recognizes seven major offset certifiers: the American Carbon Registry, the Gold Standard, the United Nations Clean Development Mechanism and Joint Implementation Mechanism, the Verified Carbon Standard, the Climate Action Reserve, and the Emissions Reduction Fund of the Australian Government. Each of these certifiers has an elaborate process of quality control intended to ensure that their offsets are: real, measurable, permanent, additional, independently verified, and unique.

As discussed in Appendix B of this report, similar criteria were chosen by the Western Climate Initiative for quality assurance in the compliance offset programs of participating jurisdictions (Appendix B is available online only at eco.on.ca). Problems with the United Nations systems are discussed below in the Text box, Additionality Problems in International Offsets.



Figure 4.5. Carbon offset credits created from voluntary offset projects that reduce, avoid or sequester GHGs, can be sold to people, organizations and businesses that want to achieve emissions reductions.

Source: Ministry of the Environment and Climate Change, "Developing a Voluntary Carbon Offsets Program for Ontario: Discussion Paper" (2017).

Ontario's Public Service – Carbon Neutral by 2018?

In November 2017, Ontario announced that it would be developing a voluntary carbon offsets program to create branded, quality offset credits that will be available to offset emissions from businesses, government, and individual buyers in the province. The voluntary offset program is distinct but complementary to the compliance offset program, and will include unique project types with an emphasis on co-benefits.

As part of its commitment to achieve carbon neutrality by 2018, the Ontario government has committed to purchasing voluntary offsets to offset GHGs from its

Because of the potential for local ecological and socioeconomic benefits, the ECO believes that the Ontario government should prioritize the purchase of Ontariobased voluntary offset credits to meet its carbon neutrality pledge. Near-term investment in Ontario offset projects could also ease the task of meeting future GHG targets in Ontario. operations. Other planned actions include increases to telecommuting, greening of government vehicles, and ensuring low-carbon procurement. For more discussion on the government's procurement strategy, see Chapter 8 of this report.



Photo credit: Legislative Assembly of Ontario/Assemblée législative de l'Ontario.

To maximize the co-benefits for Ontarians, the government should, whenever practical, purchase its voluntary offset credits from Ontario-based projects. Do offsets represent actual emissions reductions?

They can, but they have to be done right

OFFSET DESIGN REQUIRES CAREFUL ATTENTION TO WELL-KNOWN PITFALLS



4.3 Are Offsets Legitimate Reduction Tools?

Offsets have been studied extensively over the past twenty or so years.¹⁴ Offsets can help reduce GHGs in a cost-effective and efficient way, but it is surprisingly difficult to design offset protocols that will achieve these reductions.

Offset design requires careful attention to a long list of well-known pitfalls, complex science and inherently uncertain methodologies to ensure, to the extent possible, that offset projects actually reduce GHGs. Even where reductions are achieved, offset projects have the potential to cause other adverse effects. Therefore, offset projects also need to take into account other social, economic, and ecological considerations.¹⁵

ADDITIONALITY IS THE MOST IMPORTANT FEATURE OF ANY OFFSET



4.4 What Are the Key Concerns?

4.4.1 Concerns About Climate Integrity

Additionality

Offset projects must provide *additional* GHG reductions – that is, an offset project must reduce GHG emissions below the level of emissions that would have been produced under *business as usual* conditions. The issue of additionality is perhaps the most difficult to grapple with, as it requires policy makers and proponents to estimate what would have happened in a counter-factual scenario that has not occurred.

Yet additionality is also the most important feature of any offset; if the GHG reductions would have happened anyway, there is no climate benefit to be rewarded with offset credits.

In general, three main tests are used to determine whether an offset is additional: $^{\rm 16}$

1. Is the reduction required by law?

Reductions that are required by regulation or law are not additional, since the offset project proponent must achieve them anyway. For example, since the Ontario government requires large landfills to install methane capture systems, emissions reductions achieved by those systems are not additional.

2. Are the emissions-reductions practices or technologies already widely used?

If an offset project claims reductions based on practices or technologies that are already in *common use* (i.e., business as usual), then these reductions would not be considered additional. For instance, if 75% of all Canadian coal mines were found to have methanecapture systems in place, then a mine operator claiming offset credits for reductions associated with installing methane-capture technology would not meet the common use test for additionality.

3. Would the reduction have occurred without revenue from the sale of offset credits?

This is sometimes referred to as the investment or financial test. If a company has good financial reasons to invest in a GHG-reduction project, without offset credits, such a project is not additional. On the other hand, if an offset project requires revenue from the sale of offset credits to be financially viable, it will most likely meet the financial test for additionality.

This is a complex test to apply. There is no commonly accepted definition of financial viability, and organizations and individuals may routinely fail to invest in energy efficiency projects which are, in fact, financially viable over the long term.

Under the Western Climate Initiative (WCI) system, projects will not have to be financially additional in order to qualify for offset credits. The WCI and its partner jurisdictions (including Ontario) require only that a project achieves reductions that exceed common practice, and that the project demonstrates legal additionality.

Additionality Problems in International Offsets

Additionality is complex both in theory and in practice. There is a vigorous international debate about whether offset projects really provide additional GHG reductions, especially those across national boundaries.

Much criticism has been focused on international Clean Development Mechanism (CDM) and Joint Implementation (JI) offset projects. Offset credits sold under the CDM and JI regimes can be used in voluntary offset markets as well as select compliance markets, but will not be eligible for compliance instruments in Ontario. A study commissioned by the European Union concluded that 85% of the CDM projects it analyzed, and 73% of their offset credits, had a low likelihood of reducing emissions compared to the baseline (i.e., they were non-additional).¹⁷ Similarly, a 2015 study by the Stockholm Environment Institute (SEI) found that almost 75% of JI offset credits surveyed were likely non-additional, meaning that around 600 million tonnes of claimed GHG reductions might have happened anyway.18

Questionable offset projects were most common in certain host jurisdictions. For example, over 80% of offset credits generated by projects in Russia and Ukraine had significant additionality concerns, while in Poland and Germany, additionality was high (in the range of 70-97%).¹⁹

A study by a coalition of environmental groups, including the Environmental Defense Fund, also found that large hydroelectric dams in Brazil's CDM portfolio were unlikely to meet the financial test for additionality.²⁰ On the other hand, CDM staff and many people involved in international carbon markets argue that these criticisms are unfair in their expectations and overlook the real benefits of the CDM in capacity building and in financing useful projects. What is clear from more than a decade of CDM experience is that accurate, verifiable baselines are difficult to set and that claims of additional reductions are difficult to establish beyond doubt.

Permanence

In the offsetting context, *permanence* describes an irreversible reduction of GHG emissions. Concerns around permanence arise mostly with respect to offset projects that take up and store (or *sequester*) carbon from the atmosphere. The most common example of a carbon storage or sequestration project is planting trees, but carbon sequestration can also be achieved through modified agricultural practices or the restoration of grasslands and wetlands.

Offset credits allow capped emitters to emit extra GHGs that can stay in the atmosphere for hundreds of years or more. Sequestration offset projects must therefore ensure that the carbon associated with each offset credit remains sequestered for a long period. WCI offset protocols require that carbon remain sequestered for 100 years.²¹ However, urban development, forest and prairie fires, and other disturbances can all quickly release GHGs from vegetation and soil. If the sequestered carbon goes back into the atmosphere, the capped emitter's GHGs will not actually have been offset.

SEQUESTRATION OFFSET PROJECTS MUST ENSURE THAT THE CARBON ASSOCIATED WITH EACH OFFSET CREDIT REMAINS SEQUESTERED

It is challenging to ensure GHG sequestration for at least 100 years, during which the climate may change unpredictably. Few companies or contractual relationships can be relied on to see a project through for at least 100 years. Potential changes in ownership of the land present additional risks. Meanwhile, more extreme weather events, infestations and disease may all threaten the permanence of sequestration offset projects, particularly where exotic and monocultured crops are involved.



Photo credit: Creative Commons, CC0 1.0 Universal (CC0 1.0).

Perverse Incentives

Offsets can do more harm than good when they create *perverse incentives*. As discussed in section 4.1, proponents who establish offset projects sell their credits to capped emitters. The more emissions that an offset project proponent captures or destroys, the more offset credits there are to be sold. This can sometimes create a perverse incentive to generate more emissions in order to increase revenue from offset credits. It is also perverse if offset credit revenues encourage activities that are harmful to the environment as a whole (not just the climate).

OFFSETS CAN DO MORE HARM THAN GOOD WHEN THEY CREATE PERVERSE INCENTIVES



Photo credit: Creative Commons, CC0 1.0 Universal (CC0 1.0).

Perverse Incentives in Refrigerant Manufacturing

The best-known example of a perverse incentive relates to factories producing refrigerants (e.g., HCFC-22) in China and India. The manufacture of some refrigerants generates HFC by-products, which are potent GHGs. The Clean Development Mechanism allowed refrigerant manufacturers to generate offset credits by installing incinerators to destroy HFCs at their refrigerant plants. The incinerators were low cost, and the destruction of HFCs provided a significant source of revenue to the refrigerant manufacturers. This created a perverse incentive to expand refrigerant factories for the purpose of increasing the by-product, HFCs, which could then be destroyed for more offset credits. For this reason, offset credits are no longer awarded on the European Union emissions trading system for new refrigerant plants.

In some instances, offset vendors have been permitted to sell offset credits for emissions reductions that have not yet been realized. This practice is known as forward crediting. Again, this is primarily a problem with sequestration projects. The purchaser pays for the offset credits upfront, while the actual reduction in GHG emissions is to occur at some point in the future.²² If a project fails before all emissions reductions are realized, the offsets purchased did not actually occur. Timing issues are closely related to permanence; for projects that must sequester carbon for 100 or more years, credits awarded before the 100th year represent removals that may never occur.

LEAKAGE IS THE SHIFTING OF EMITTING ACTIVITIES FROM ONE LOCATION TO ANOTHER

Leakage

Leakage is the shifting of emitting activities from one location to another. For example, protecting a forest in one location (to sequester carbon) does not change market demand for wood or pulp; logging could simply shift to a different forested area, with no net reduction in emissions. Shifting GHGs across boundaries may reduce emissions in one jurisdiction, but would not reduce overall GHG emissions; any emissions avoided in the original jurisdiction would merely be produced in the new one.



Forest near Thunder Bay, Ontario. Photo credit: Shutterstock, 2018.



Pine logs stacked at a lumber mill in Ontario. Photo credit: Shutterstock, 2018.

Double Counting

Double counting refers to counting the same emissions reductions twice.²³ This most often occurs where there are multiple mitigation schemes operating with respect to the same sources and sinks, or where compliance instruments are issued by more than one jurisdiction in an inter-jurisdictional emissions trading system.²⁴ For example, Canada and Brazil are both parties to the Paris Agreement. If Canada were to purchase credits from Brazil for emissions reductions attributed to a reduced deforestation program in the Amazon rainforest, which country would claim the reduction toward its Nationally Determined Contribution under the Paris Agreement? If both Canada and Brazil claimed the reductions as a result of the project, the reported reductions would be two times the reductions achieved in reality.

4.4.2. Social, Economic, and Ecological Concerns

GHG Reduction is Not Enough

Beyond concerns about the climate integrity of offset projects, offsets can also generate other social, economic, and ecological concerns. If offset projects focus solely on reducing GHGs, considerations about biodiversity, human rights, and other non-GHG impacts may be overlooked. These concerns arise most often when offset projects take place in jurisdictions with weak environmental and human rights laws. Addressing these concerns has been a strong focus of voluntary offset certifiers, such as the Gold Standard.

Mount Elgon National Park and Human Rights Abuses

For now, Ontario proposes to allow capped emitters to purchase offset credits from projects approved by Ontario or by its Western Climate Initiative partners (i.e., Quebec and California) and located either in Canada or the United States. As noted in the ECO's 2016 Greenhouse Gas Progress Report, it is possible that Ontario may one day accept credits from places with less stringent protections for the environment and human rights. The risks of accepting credits from countries with weaker environmental and human rights regulations have been illustrated by Clean Development Mechanism projects such as the Dutch FACE Foundation's forest offset project in east Uganda. In that case, a Dutch company sought to plant 25,000 hectares of fast-growing, exotic eucalyptus trees near Uganda's Mount Elgon National Park. The project displaced more than 6,000 villagers living along the boundary of the park.²⁵ Villagers' crops were destroyed, and shots were allegedly fired at those attempting to access the areas allotted for offsetting.26

IF OFFSET PROJECTS FOCUS Solely on Reducing GHGS, Biodiversity, Human Rights, and other Non-GHG Impacts May Be overlooked

For many years, environmental justice advocates have highlighted social and environmental issues with some international offsets,²⁷ even in developed countries.²⁸ However, there are also positive examples.



Photo credit: The Association for Coastal Ecosystem Services.

Mikoko Pamoja: A Success Story

The Mikoko Pamoja Mangrove Restoration and Reforestation Project in Gazi Bay, Kenya, illustrates the positive impacts that offset projects can have for communities and ecosystems.²⁹ This project is financed by voluntary carbon credits and has consistently met its reduction targets since initiation in 2010. Through the project, participating communities have been able to restore mangrove ecosystems, enhance ecosystem services, and promote sustainable mangrove-related income (the project has provided employment security for members of the local community in addition to building materials, tourism, and coastal protection). Funds from the project have also been used for school construction projects, purchasing books, and installing water pumps. This example shows that carbon offset projects in developing countries can create socio-economic and ecological benefits, while also contributing to GHG emissions reductions.

Stakeholder Consultation and Input Are Key

Often, the success of an offset project will depend on buy-in from the local community. Consulting with stakeholders can help government to identify adverse social, environmental, or economic impacts before a project reaches the implementation phase, and may help ensure the continued success of the project.³⁰

The Government of Ontario has promised to pay particular attention to the Indigenous communities that stand to be affected by offset projects on their traditional lands.

OFTEN, THE SUCCESS OF AN OFFSET PROJECT WILL DEPEND ON BUY-IN FROM THE LOCAL COMMUNITY

On the Frontlines of Climate Change: First Nations, Metis and Inuit Communities

Many Indigenous communities are already feeling the effects of climate change. Melting ice roads and disappearing permafrost, increased frequency and severity of forest fires, droughts and flooding, and changes to abundance and distribution of species are all having a disproportionate impact on Indigenous peoples. These communities may also be on the forefront of some offset projects, especially forest projects. Drawing on the traditional knowledge of Indigenous communities, and ensuring that offset project developers work together with local Indigenous populations, could help ensure the integrity and success of offset projects in Ontario and elsewhere in Canada.



Photo credit: The Associated Press.

How will Ontario ensure high-quality offsets?

Offset protocols will be the main quality assurance mechanism

4.5 Ontario's Proposed Offset Program

In this chapter, the term *Ontario offset credits* is used to describe credits that will be created by the Ontario government for use as compliance instruments in Ontario's cap and trade system (as opposed to *voluntary offset credits*, which are bought and sold on the voluntary carbon market – see earlier section of this report and Appendix B, available online only at eco.on.ca, for more information on voluntary offsets). Ontario offset credits must be created under section 35 of the *Climate Act* in respect of offset projects that are to be registered under section 34 of the Act. Subject to geographic limitations set out in individual offset protocols, these projects can be located *anywhere in Canada* other than in Quebec.

While Ontario will register projects only in Canada, capped emitters in Ontario will be able to buy offset credits created by other WCI partners (i.e., Quebec and California). Because California registers offset projects anywhere in the continental U.S., Ontario's linkage with California will mean that Ontario emitters will be able to buy credits from projects located anywhere in either the U.S. or Canada. ONTARIO EMITTERS WILL BE ABLE TO BUY CREDITS FROM PROJECTS LOCATED ANYWHERE IN EITHER THE U.S. OR CANADA



Nine main steps must be followed before offset credits can be used as compliance instruments:

- 1. Ontario must set up the formal regulatory system to create and manage offset credits. An *Ontario Offset Credits Regulation* came into force in January 2018, but further developments are expected before the system is fully functional.
- 2. Ontario must approve protocols for each type of offset project that will be accepted for registration.

What is an Offset Protocol?

An offset protocol sets out the rules to be followed by offset project proponents to ensure that projects meet minimum criteria for the creation of offset credits. Protocols are being developed for each class or type of offset project, and will provide instructions for quantifying GHG reductions achieved as compared to the offset project baseline. Protocols also specify things like data collection methods, monitoring procedures, and emissions factors to account for uncertainty.

So far, there are thirteen planned

project types

3. Offset project proponents (i.e., those developing the project) must develop a specific offset project, in accordance with an applicable protocol, and apply to register it in the (yet-to-be-created) public offset registry.

- 4. The offset project must reduce a quantifiable number of GHG emissions or remove a quantifiable number of GHGs from the atmosphere.
- 5. The quantity of GHGs reduced or removed must be verified by an accredited third party.
- 6. The proponent must apply for offset credits for each of the verified GHG reductions or removals.³¹
- 7. The ministry must review the application, and if approved, issue the appropriate number of offset credits.
- 8. Depending on the quantification and crediting methodology, some of the offset credits must be transferred to a buffer account. These credits are intended to make up for offsets that subsequently turn out to be invalid or intentionally or unintentionally reversed.
- The remaining offset credits will be transferred to the account of the offset project proponent, who may use them as compliance instruments or sell them to third parties.

For more detailed information on the offset credit creation process, see Appendix B of this report (available online only at eco.on.ca).

4.6. Ontario's Offset Rules

4.6.1 Overview of Protocols

What offset projects

are eligible for Ontario credits?

Ontario, in collaboration with Quebec, is developing 13 protocols for offset projects under Ontario's cap and trade system. Of these 13 protocols, Ontario has prioritized three for early implementation: landfill gas capture and destruction; mine methane capture and destruction; and ozone depleting substances (ODS) capture and destruction. The landfill gas protocol was finalized at the end of 2017, while the remaining protocols are expected to come into effect in 2018. Table 4.1 lists the proposed offset protocols and gives a brief description of project types.
 Table 4.1. Descriptions of Ontario's 13 Proposed Offset Protocols.

Offset Project Category	Offset Protocol	General Project Description
Methane capture projects	Landfill gas capture and destruction	Installation of methane gas capture and destruction devices at eligible landfill sites in Canada, to treat or destroy methane above and beyond any historical or legally mandated management of methane.
	Mine methane capture and destruction	Installation or operation of devices to capture and destroy methane from coal mines (outside Ontario but within Canada) that would have otherwise been vented to the atmosphere.
Ozone depleting substances (ODS) and refrigeration systems projects	Ozone depleting substances capture and destruction	Activities undertaken to destroy ODS from foam or refrigerants either removed from refrigeration, freezer or air-conditioning appliances or commercial installations, or intended for those uses, recovered in Canada.
	Refrigeration systems	Use of low- or no-global warming potential alternatives to hydrofluorocarbon (HFC) refrigerants in the manufacture and installation of new refrigeration and air conditioning equipment and systems.
Agricultural and grassland projects	Conservation cropping	Implementation of direct seeding and minimal tillage farm practices to sequester GHG emissions in agricultural soils.
	Nitrous oxide reductions from fertilizer management in agriculture	Reduction in N ₂ O emissions due to changes in nitrogen fertilizer application practices, including rate, source, time and placement compared to baseline application rates at the project site.
	Emissions reductions from livestock	Reduction of GHG emissions associated with manure management and enteric fermentation on livestock operations including biogas control systems, livestock feeding practices, and manure management practices.
	Grassland projects	Avoided conversion of natural grasslands and pasturelands to cropland to decrease soil carbon loss.
Anaerobic digestion and organic waste management projects	Anaerobic digestion	Diversion of eligible organic materials and/or agro-industrial wastewater away from treatment and disposal systems to anaerobic facilities with biogas control and methane destruction capabilities.
	Organic waste management	Composting of organic waste from one or more eligible waste streams (e.g., food waste and non-recyclable food soiled paper) at a composting operation, and/or combustion of biomass for energy.
Forest projects	Forest management	Increased GHG reductions and/or removals (associated with the sequestration of carbon) achieved by increasing and/or conserving carbon stocks through avoided conversion and improved forest management measures.
	Afforestation and reforestation	Increased sequestration through the return of cleared areas to forest or the conversion of non-forested areas (i.e., more than 10 years without trees) to forest.
	Urban forest projects	Tree planting and maintenance activities to increase carbon storage in urban trees, including projects by municipalities, utilities, educational institutions, and other organizations.



4.6.2 A Closer Look at Ontario's Proposed Protocols

The following pages provide the ECO's ratings for Ontario's proposed offset project types based on information available to date. The ratings are meant to provide an overview of the merits of each protocol for Ontarians. Each protocol is rated as:

- Green (move forward): little to no regulatory or socio-ecological concerns and/or high capacity for climate mitigation and/or co-benefits;
- Amber (proceed with caution): some regulatory or socio-ecological concerns and/or questionable (or unknown) mitigation or co-benefit potential; or,
- Red (stop): high level of regulatory or socio-ecological concerns and/or low mitigation or co-benefit potential.

As noted above in section 4.5, offset projects registered in Ontario can take place anywhere in Canada (other than Quebec) and still be eligible for Ontario credits. Therefore, discussion of each protocol will consider national emissions levels as well as considerations specific to different jurisdictions throughout Canada.

LANDFILLS ARE A SIGNIFICANT SOURCE OF THE POTENT GHG, METHANE



4.6.3 Methane Capture Projects Landfill Gas Capture and Destruction

Landfills are a significant source of the potent GHG, methane. Methane is produced when organic matter (e.g., food waste) decomposes without oxygen. In 2015-2016, landfills produced 22% of Canada's methane emissions.³² Over a 20-year timescale, the global warming potential of methane is 86 times greater than that of carbon dioxide, meaning that this gas could cause significant warming over a short period of time.

Technology is readily available to capture methane from landfills. The gas can be captured and destroyed through flaring or other processes, which greatly reduces the net GHG emissions released into the atmosphere. Landfill gas (LFG) can also be captured and used as an energy source for generating on-site electricity or heat; for use as fuel in generators and heavy-duty vehicles; or, for feeding into the provincial natural gas grid.

California does not have an LFG protocol; Quebec does.

The key issue for LFG projects is additionality. No offset credits can be created for LFG capture that is required by law, or would have happened anyway. While there are no federal regulations for LFG capture and destruction in Canada, many Canadian provinces have regulations or policies that require LFG control or capture, especially at larger landfills.³³ For instance, Ontario Regulation 232/98, made under the *Environmental Protection Act*, requires that any new landfill or expansion to an existing landfill with a capacity greater than 1.5 million cubic metres have a plan to control LFG during site operation and following closure. Regulation 347 imposes the same requirement on existing sites of the same size. Quebec's *Environmental Quality Act* and its regulations impose

similar requirements for the collection and destruction of methane emissions at large landfills. Quebec therefore recognizes LFG offset credits only for small landfills.

LFG offset project proponents seeking Ontario offset credits must prove that their projects have achieved reductions that would not otherwise have occurred (i.e., that they are additional).³⁴ It is not yet clear how this would be done for landfills that already have (or are required to have) methane collection systems. However, existing methane collection systems are not likely collecting all the methane being generated from a given site. In principle, improvements that capture more methane could qualify for credible offsets, through good program design and monitoring.³⁵

Small landfills in Ontario not subject to the landfill capture regulations do not have the same problems with additionality, but may not generate enough methane to make collection systems cost-effective. Further, it is unclear how the economics of methane capture for LFG projects will be affected by the government's proposed waste diversion measures under the Strategy for a Waste-Free Ontario and proposed Organics Action Plan. Under the strategy, the province may ban landfilling of food and organic waste, support processing capacity, and stimulate end-markets for food and organic waste. Because these efforts may reduce the amount of organic material in landfills, they could reduce the amount of methane produced and make methane capture projects at landfills uneconomical. Overall, because of existing regulatory frameworks, the potential of landfill projects in Ontario to create offsets may be low.

LFG Success Story

The Fredericton Region Solid Waste Commission's Landfill Gas Management System is a Canadian offset project that collects between 75,000 and 80,000 tonnes of waste annually in a landfill fitted with a methane capture system. By capturing and flaring the landfill gas, the project keeps approximately 45,000 tonnes of CO₂e out of the atmosphere each year, and has created more than 50 local jobs.³⁶ The project is additional because New Brunswick does not mandate methane capture at this landfill.

LFG capture projects are not likely to face leakage (i.e., migration out of Ontario) or permanence concerns, and have the potential to reduce a significant amount of emissions.³⁷ LFG projects also have the potential to create socio-economic co-benefits, including reduced air pollution, local jobs, revenue from offset credits, and a source of renewable natural gas.



The potential for local socio-economic co-benefits and some level of climate mitigation make the proposed LFG offset protocol a wise choice for Ontario's offset program.

Mine Methane Capture and Destruction

Methane released from coal mines accounts for about 8% of global anthropogenic methane emissions.³⁸ Methane previously trapped in coal seams seeps into the air during active mining, but can continue to be released well after mines are closed or abandoned.³⁹ Because of methane's high global-warming potential, reducing emissions of this gas is an important part of global mitigation efforts. Like LFG, coal mine methane can be either destroyed through flaring or oxidation, or it can be captured and used as a fuel.



Photo credit: Creative Commons, CC0 1.0 Universal (CC0 1.0).

Ontario plans to award offset credits to eligible active coal mines anywhere in Canada that, on the offset project start date, were not capturing and using/destroying methane from their operations. Analyses of coal mine methane projects under the Clean Development Mechanism indicate that, compared to other offset project types, these projects have a high likelihood of being additional.⁴⁰ To date, no federal or provincial regulations in Canada require the capture and/or destruction of methane from coal mines, and coal mine methane capture and

BECAUSE OF METHANE'S HIGH GLOBAL-WARMING POTENTIAL, REDUCING EMISSIONS OF THIS GAS IS AN IMPORTANT PART OF GLOBAL MITIGATION EFFORTS

destruction does not appear to be common practice. If such regulations were adopted, mine methane capture would not be eligible for offset credits.

Quebec already awards offset credits for projects that reduce GHG emissions from drainage and ventilation systems of active surface and underground coal mines, whereas California awards credits for reductions from active and abandoned underground coal mines (as well as surface coal and trona mines). Therefore, regardless of whether Ontario introduces a coal mine methane protocol, such offset credits will be available for purchase and use by Ontario emitters.

Coal is a source of serious climate and environmental harm. Awarding credits to active coal mines could create a perverse incentive to increase or continue mining, and could subsidize the cost of producing coal. However, the federal government has committed to phasing out coal use for power generation across Canada by 2030, making it less likely that mine methane offset revenue would incent increased production of coal for the domestic market. The California Air Resources Board studied mine methane projects under the California offset program, and found no increase in U.S. coal mining (either increased production at existing mines or the establishment of new mines) as a result of offsetting.⁴¹ The Air Resources Board study concluded that offset project returns were not sufficient to influence coal production decisions.

Generally, mine methane projects do not have carbon leakage or permanence concerns, and could result in increased revenue for mine operators and local communities. However, they are unlikely to yield co-benefits for Ontarians: coal is not found in Ontario, meaning that no such mines exist in the province. As a result, any co-benefits in terms of local jobs and additional revenue from offset credits will accrue outside of Ontario.

RATING:

While in theory it is possible that offset revenue could encourage marginal coal mines in Canada to operate longer, therefore resulting in higher methane emissions, there is no evidence that this will be the case. A coal mine methane protocol would help target a significant source of methane emissions that provinces do not regulate and would otherwise be emitted to the atmosphere. As a result, the ECO recommends that the province proceed with caution in developing a coal mine methane protocol, and commit to working with its WCI partners to monitor any influence that offset revenues may have on North American coal production.

COAL IS A SOURCE OF SERIOUS CLIMATE AND ENVIRONMENTAL HARM



CFCS ARE UP TO 13,900 TIMES MORE POWERFUL GHGS THAN CO,



4.6.4 Ozone Depleting Substances and Refrigeration Systems Projects

Ozone Depleting Substances Capture and Destruction

Ozone depleting substances (ODS) are humanproduced gases that deplete the ozone layer and also have an outsized impact on the greenhouse effect. These substances are generally described as halocarbons, and include the highly potent chlorofluorocarbon (CFC) group, as well as less damaging groups such as hydrochlorofluorocarbons (HCFCs). CFCs are up to 13,900 times more powerful GHGs than CO_2 over a 100-year timeframe, while HCFCs are anywhere from 79 to 1,980 times more powerful.⁴² These gases have been widely used for refrigeration and air conditioning, and in other applications including dry cleaning, electronic equipment cleaning, and agricultural pest control.

In 1987, the international community agreed to the *Montreal Protocol on Substances that Deplete the Ozone Layer* (referred to as the Montreal Protocol), which established timetables for the phase-out of a number of ODS. As a result of widespread adoption and implementation of the Montreal Protocol, the global production and use of ODS has significantly decreased, although some developing countries (including China and India) continue to produce HCFCs for refrigeration and other applications.

The primary way Canada meets its phase-out obligations under the *Montreal Protocol* is via the federal *Ozone-depleting Substances and Halocarbon Alternatives Regulations* under the *Canadian Environmental Protection Act, 1999*. These regulations are aimed at controlling the manufacture, use, sale, and import/export of ODS in Canada.⁴³ As of 2015, Canada had successfully reduced the production and consumption of HCFCs by 94% from baseline levels, and had completely phased out 100% of production and consumption of all other controlled ODS from the baseline.⁴⁴ The federal targets require Canada to completely eliminate the use of HCFCs by 2030. However, the regulations do not establish destruction requirements for existing sources in Canada.

Ontario's proposed ODS protocol will award offset credits to project proponents to extract and destroy ODS from foam-blowing agents and refrigerants. Quebec and California already have ODS protocols with similar provisions.

Ontario's ODS protocol is unlikely to produce leakage concerns, and additionality issues will likely be low, since destruction of foam and refrigerant ODS is not considered to be common practice in Canada, and there are no laws or regulations requiring the destruction of these substances. Similarly, permanence is not at issue, since once ODS are destroyed, they cannot be released back into the atmosphere.

On the issue of perverse incentives, existing regulations prohibit the production and import of ODS in Canada, and recovery and extraction of eligible products must be carried out in Canada. Together, these requirements prevent offset proponents from creating or obtaining new refrigerants for the sole purpose of destroying them to create offsets. Therefore, there is little risk that the protocol will create a perverse incentive to increase ODS production.

SOME SAY REFRIGERANT MANAGEMENT IS THE NUMBER ONE CLIMATE MITIGATION PRIORITY

Studies suggest that targeting ODS will have a significant impact on reducing near-term climate change; in fact, some have identified refrigerant management as the number one climate-mitigation priority.⁴⁵ However, the opportunities for co-benefits flowing from ODS destruction projects are difficult to ascertain. The Ministry of the Environment and Climate Change has not determined where ODS destruction projects are likely to be developed in Canada, meaning that this protocol could have limited benefits to Ontarians. Nevertheless, given the large contribution of ODS to climate forcing and the low level of regulatory concerns, this protocol could play an important role in Ontario's mitigation goals.

RATING:

Given the low potential for regulatory or other concerns, and given the high mitigation potential of ODS offset projects, the ECO supports the development of the proposed ODS offset protocol.

Refrigeration Systems

Refrigeration systems contain certain GHGs as part of their cooling and insulation systems. Although these gases are trapped in the system during the useful life of the equipment, gases may be released into the atmosphere during manufacturing and disposal. Hydrofluorocarbons (HFCs) were originally created to replace CFCs and HCFCs in refrigeration systems, since HFCs do not contribute to ozone depletion.⁴⁶ However, HFCs come with a significant climate price tag: HFCs have up to 12,400 times greater capacity to warm the atmosphere than CO_2 on a 100-year time scale,⁴⁷ and are in wide use around the world. This means that reducing HFCs is extremely important to reduce near-term global warming.⁴⁸



Photo credit: Marco Traverso.

INSTALLING HFC-FREE TECHNOLOGY COULD PREVENT A SIGNIFICANT AMOUNT OF FUTURE GHG EMISSIONS FROM ENTERING THE ATMOSPHERE



While California has its own ODS protocol, it has not developed a refrigeration systems protocol such as the one Ontario is considering, nor has Quebec.

Ontario's proposed refrigeration systems protocol will award credits for the use of low- or no-global warming potential alternative refrigeration materials in new refrigeration and air conditioning equipment and systems. Examples of alternative refrigerants with lower global warming potential include propane, ammonia and CO_2 . Currently, there appears to be little incentive for manufacturers to use these alternative products.

Based on the information available, concerns about leakage, additionality, permanence, and perverse incentives appear to be negligible for this type of offset project. In light of increasing demand for air conditioning products, the possible benefits to Ontarians are likely significant; those involved in manufacturing and installing refrigeration and air conditioning systems in the province could make considerable returns by switching to alternative refrigeration materials. Installing HFC-free technology could prevent a significant amount of future GHG emissions from entering the atmosphere.



The proposed refrigeration systems protocol appears to present negligible regulatory or other concerns; has a high mitigation potential; and may have significant co-benefits for Ontarians. Pending final program design, the ECO enthusiastically endorses this offset protocol.

4.6.5 Agricultural and Grassland Projects

Conservation Cropping

In modern agriculture, some farmers till their land to remove weeds, incorporate organic matter and/or mix in fertilizers prior to and after planting. However, tilling can expose water that would otherwise be stored in the soil, causing increased evaporation. When organic matter is exposed to the air, it becomes oxidized, and the carbon in the soil is also released into the atmosphere. Tilling also breaks down soil structure, and disrupts the soil food web, which can dramatically reduce the amount of carbon stored in the soil. This has negative effects on the climate and can reduce the productivity and resilience of agricultural soils. The ECO reported on this in *Putting Soil Health First: A Climate-Smart Idea for Ontario*, in 2016.

Conservation cropping is designed to increase the ability of agricultural soils to store carbon and to reduce soil loss. Some of the core tenets of this type of agriculture include:

- Minimizing soil disturbance through low- or no-till practices;
- Maintaining soil cover by leaving crop residues in place after harvesting, or growing cover crops; and
- Managing crop rotation by growing different crops on different parcels of land on a rotating basis.

THE ECO HAS SERIOUS CONCERNS ABOUT THE PERMANENCE OF CARBON SEQUESTRATION FROM CONSERVATION CROPPING





Photo credit: Shutterstock, 2018.

More than 93 million acres of Canadian land are currently devoted to crops.⁴⁹ Conservation cropping techniques can improve soil health, increase crop yield, and decrease GHG emissions associated with agricultural production. However, there are many challenges associated with using conservation cropping to create compliance offset credits.

The single largest issue is permanence; conservation cropping only sequesters carbon while conservation practices are sustained. When farmland changes ownership, and/or when economic conditions shift, a change in farming practices can quickly release the sequestered carbon. Farming practices can change multiple times in a century, and even one tillage event can result in significant GHGs (anywhere from 1-11% of soil carbon lost after one tillage).⁵⁰ Soil carbon can also be lost as soil temperatures increase, which is a likely consequence of climate change, making accurate long-term sequestration calculations difficult. Given these issues, the ECO has serious concerns about the permanence of carbon sequestration from conservation cropping.

Such offsets also present significant difficulties with respect to additionality. Due to vast differences in soil characteristics and quality across Canada, establishing an appropriate baseline is challenging. More importantly, many farmers already opt for no-tillage practices⁵¹ to reduce labour and fuel costs, as well as soil loss, and to increase resilience to floods and droughts. Thus, it is difficult to demonstrate that conservation cropping projects would not have been undertaken under a business-as-usual scenario. Additionality will become increasingly doubtful as conservation cropping spreads (as it is expected to do).

The potential of agricultural carbon sequestration is significant on a global scale; the organization Drawdown ranks conservation agriculture as the 16th most important climate change solution (out of 80) based on its global mitigation potential, as well as low implementation cost, and anticipated operational savings to those who adopt conservation practices.⁵² However, this potential depends on widespread adoption; while exact sequestration rates remain uncertain, one study estimates that depending on the region, the use of no-till conservation cropping techniques results in sequestration of only 0.3 tonnes of carbon per hectare per year⁵³ (although this amount could be much lower⁵⁴ or much higher).⁵⁵

Offset projects for conservation cropping are politically popular in rural areas and generally easy to implement. They can channel revenue into rural communities, which may suffer disproportionately from increases in the cost of energy as a result of cap and trade. In Alberta, the largest number of offset credits were issued for conservation cropping, and a significant number of those credits remain banked for future use.⁵⁶ Neither Quebec nor California has an existing conservation cropping protocol, meaning that if implemented, Ontario's conservation cropping protocol would introduce a new class of offsets to the WCI market. While the ECO recognizes the climate and socioeconomic co-benefits of conservation cropping, there are also significant concerns around permanence and additionality. On balance, the ECO does not support an offset protocol for conservation cropping. Instead, the ECO continues to recommend that the government provide other forms of financial support to encourage farmers to transition to a soil health approach, which includes conservation cropping. In particular, the ECO believes the government should link crop insurance to soil-carbon levels to incent practices that sequester more carbon, and repurpose fossil fuel subsidies to support ecosystem services provided by farmers.

RATING:

The concerns about permanence and additionality that arise with conservation cropping projects make this type of project inadvisable for inclusion in Ontario's offset program.

Nitrous Oxide Reductions from Fertilizer Management in Agriculture

Nitrogen-based fertilizers have been widely used around the globe to increase agricultural productivity and crop yield. However, much of the fertilizer applied to crops is not taken up by plants, which results in significant impacts to the climate and local environment.

Over-application of nitrogen fertilizers has many detrimental effects, including: creating oxygen-depleting algal blooms, altering fresh-water ecosystems, and in some cases causing major fish kills; and polluting drinking water sources. It also contributes to global warming through the production of N_2O – a GHG 298 times more powerful than carbon dioxide.



Algal bloom absorbing nutrients from runoff fertilizers, on an inland lake in springtime.

Photo credit: Shutterstock, 2018.

In Canada, GHG emissions from the application of nitrogen fertilizers increased by 94% from 1990 to 2015.⁵⁷ This increase resulted in a 190% jump in emissions of CO_2 from urea-based carbon-containing fertilizers in the same period.⁵⁸

Neither California nor Quebec has an existing fertilizer management protocol, meaning that a protocol developed by Ontario (jointly with Quebec) would introduce a new class of offsets into the linked WCI market.

OVER-APPLICATION OF NITROGEN FERTILIZERS HAS MANY DETRIMENTAL EFFECTS

Better fertilizer management can reduce the damaging environmental and climate effects of nitrogen fertilizer use by adjusting the amounts, times, and locations of application to reduce over-use. The more nitrogen is taken up by crops, the less is left over to be converted into nitrous oxide by microbes. Thus, better matching fertilizer applications to the specific needs of crops can yield substantial reductions in GHG emissions. As detailed in the ECO's report *Putting Soil Health First: A Climate-Smart Idea for Ontario*, the commonly accepted framework for best fertilizer management is called 4R Nutrient Stewardship. This is a science-based approach to applying nitrogen fertilizer for optimal use in terms of high and healthy yields and reduced environmental harm.

The 4R Nutrient Stewardship framework consists of four parts:

- Right source: Farmers should choose the right type of fertilizer to apply based on environmental, plant, and soil characteristics.
- Right rate: Farmers should use on-site measurements of nitrogen in soils, together with knowledge of the needs of different crop types, to better gauge the amount of fertilizer to apply.
- Right time: Fertilizer should be applied at targeted times to ensure crops are getting the necessary nutrients when they are most needed.
- Right place: Fertilizer should be applied strategically to maximize uptake by plants and help to reduce nutrient loss.



Right Source





Right Time

Right

Rate



Right Place

Figure 4.6. Four R Nutrient Stewardship Framework.

A 2015 report by the Climate Trust showed that if corn and soy growers in the Midwestern United States adopted best management practices in fertilizer use, this could reduce up to 2.7 million tonnes of CO₂e per year, the equivalent of taking 568,000 cars off the road,⁵⁹ or more.⁶⁰ Reduced use of fertilizers also helps to protect drinking water sources and freshwater bodies. In a province like Ontario that is both rich in freshwater and home to more than 50% of Canada's highest quality farm land,⁶¹ better nitrogen fertilizer management could have significant human and ecosystem health benefits. Offset credit revenue could also help rural communities pay the higher costs of fossil fuels that will flow from cap and trade. Fertilizer management offset projects raise obvious concerns around additionality. Better fertilizer management may require some additional initial expenditures by farmers (e.g., for more precise soil mapping and monitoring equipment, and for precision fertilizer application equipment). However, in return for these investments, farmers would save a lot of money from reduced fertilizer costs, not to mention the other environmental benefits of reduced fertilizer use. Many farmers have recognized these benefits and have begun to adopt best management practices in fertilizer use already. As a result, it may be difficult to show that fertilizer changes do not form part of the business-as-usual scenario for many farmers in Ontario and across Canada. The fertilizer management protocol will therefore require careful baseline setting and appropriate safeguards to lower the risk of crediting non-additional projects.

At the time of writing, the government has not yet released a draft of its fertilizer management protocol. Depending on how the protocol is drafted, it could incentivize the continued use of synthetic fertilizer rather than rewarding farmers who do not use it or who already use it well. This would be unfair.

RATING:

If the protocol is carefully drafted, the mitigation potential of these projects coupled with significant ecological and socio-economic co-benefits could make these projects worthwhile. As the ECO expects that the adoption of best management practices in fertilizer use will become widespread over time, the protocol should have sufficient means of accounting for additionality risks, both through baseline setting and other safeguards, such as a discount factor. It should include provisions for crediting farmers who do not use synthetic fertilizers, or alternatively, the government should provide an equal or better level of government support for such operations.



GLOBAL WARMING AXIS OF EVIL

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Emissions Reductions from Livestock

Cattle and other ruminants have a unique digestive system, which produces methane through a process known as enteric fermentation. Methane emissions from enteric fermentation account for more than 14% of global anthropogenic GHG emissions and more than 24% of Canada's methane emissions.⁶³



Figure 4.7. Breakdown of Canadian agricultural emissions.

Source: Environment and Climate Change Canada, National Inventory Report 1990-2015: Greenhouse Gas Sources and Sinks in Canada, Part 1 (Ottawa: ECCC, 2017) at 68-71. Almost all emissions from enteric fermentation (96%) come from cattle rather than other types of livestock. THE SCIENCE IS NOT YET ADEQUATE TO SUPPORT AN OFFSET PROTOCOL FOR ENTERIC FERMENTATION

Enteric fermentation offset projects typically involve changes to livestock diet, with the expectation that livestock eating the revised diet will produce less methane.

The principal problem with enteric fermentation is that it is very difficult to reliably quantify the GHG reductions that these projects would achieve.

Additionality is also a hurdle with these projects because of challenges in setting appropriate baselines. Farms across Canada and around the world use a variety of livestock management techniques, and may feed animals different diets depending on the season, the weather, and/or on the price and availability of feedstocks. There are many species and breeds of livestock farmed across the country, and the size of farms can vary widely, from one or two animals to many thousands. These variables make it difficult to set baselines, since the level of emissions will vary depending on the type of farm and livestock.

The California Air Resources Board has concluded that the science is not yet adequate to support an offset protocol for enteric fermentation in California.⁶⁴

Like other agricultural protocols, a livestock protocol could produce economic co-benefits for some of those living in rural Ontario, although livestock production in Ontario has dropped in recent years.

RATING: ?

Overall, because very little is known about the proposed enteric fermentation offset protocol, the ECO does not have enough information to provide a rating or make an informed assessment of its relative merits and demerits. If such a protocol is developed, it will need to consider the full impacts of these types of projects on a suite of social and ecological values.

Grassland Projects

Grasses and shrubs absorb CO_2 from the atmosphere through photosynthesis, and store the carbon in their tissue. In established grasslands, some of this stored carbon is also transferred to the soil, resulting in storage of carbon over long time scales. When grasslands are converted to agriculture or disturbed by other natural or human activity, the carbon stored in the soil and plants can be released back to the atmosphere. This means that the ability of a grassland to act as a carbon sink depends to a large extent on its protection from disturbance.

While native grasslands, also known as tallgrass prairies and savannas, once covered a significant part of southern Ontario's landscape, less than 3% of Ontario's original grasslands remain.⁶⁵ Urban development, agriculture, and pollution have all contributed to the loss of Ontario's grasslands.

Grassland project proponents under Ontario's offset program would be able to earn offset credits for stewarding grasslands and protecting them from disturbance. Neither Quebec nor California has an existing grassland protocol, meaning a protocol developed by Ontario and Quebec would be the first of its kind in the WCI compliance market.

For the purposes of the protocol, *grasslands* will likely include areas dominated by native or introduced grass species, and which have been continuously covered by grassland for at least 10 years prior to the project start date. This could include both natural grasslands as well as pasturelands managed through livestock grazing or other agricultural methods (such as fertilization, irrigation, and/or seeding).

According to the Food and Agriculture Organization, the global mitigation potential of grasslands is high.⁶⁶ However, there are serious permanence risks with grassland offset

projects. Even if a protected grassland stores carbon for years, a single brushfire could cause die-back of plant life and the release of significant amounts of carbon. These risks are further exacerbated by climate change; increased extremes in temperature and changing precipitation patterns are expected to lead to increased drought and greater risk of fire. These changes could affect not only the storage potential of grasslands, but also their capacity to provide habitat to wildlife.

Depending on the size, location, and agricultural potential of the project site, grassland offset projects could be vulnerable to carbon leakage, since the preservation of grassland in an area where the rate of agricultural development is high could merely shift production elsewhere outside the project boundary. However, the potential inclusion of pasturelands in the protocol could limit competition between livestock grazing operations and grassland projects, therefore moderating some of the leakage risk.⁶⁷ Perverse incentives are not likely to come into play with grassland projects, but additionality issues related to baseline setting could reduce the credibility of these projects, particularly given the range of project types being considered.

Despite these challenges, grassland projects could have significant co-benefits. Sheltering Ontario's remaining grasslands from disturbance (including through prescribed burns) could bolster protection for the species that rely on grassland ecosystems. Even though very little grassland remains in Ontario, this protocol could nevertheless help protect what little natural grassland Ontario does have left. And, including pasturelands under the grassland protocol could provide a source of revenue for livestock farmers in the province.

As the case of Windsor's Ojibway Prairie Complex illustrates below, protecting Ontario's grasslands could strengthen recreation and tourism programs in parts of Ontario that are home to these unique ecosystems.



Photo credit: Creative Commons, CC0 1.0 Universal (CC0 1.0).

The Ojibway Prairie Complex: A "Garden of Rarities"

Tallgrass prairies used to cover 23% of North America,⁶⁸ but today, less than 0.2% of North America's original tallgrass prairie ecosystem remains intact.⁶⁹ These ecosystems are considered globally endangered, as are many of the species that call them home. One of the last vestiges of this ecosystem in Ontario is found in the Ojibway Prairie Complex in Windsor, Ontario. The Ojibway Prairie Complex is home to a number of endangered species and forms part of the Detroit Wildlife Refuge, the only international wildlife refuge in North America. There are over 4,000 species that live in the Prairie Complex, many of which cannot be found anywhere else in Canada.⁷⁰ One species of insect, the *Loxocera ojibwayensis*, cannot be found anywhere else in the world.⁷¹ Over 21 other endangered and threatened species call the Ojibway Prairie home⁷² and, on two occasions, the reserve has had the top butterfly counts for all of North America.⁷³

In 2015, the Ontario Municipal Board gave the green light to a large retail development adjacent to the Ojibway Prairie Complex, despite significant local backlash. Local groups have continued to advocate for greater protections for the reserve, including the closing of Matchette Road, which bisects the area and poses a threat to endangered and threatened species. But without greater leadership by local and provincial officials, the Ojibway Prairie Complex, and the species that depend on it, will remain in danger of disappearing.

THE GLOBAL MITIGATION POTENTIAL OF GRASSLANDS IS HIGH



Tallgrass prairies are an important part of Ontario's natural heritage. The global climate mitigation potential of grasslands is high, and while very little of Ontario's natural grasslands remain, the development of grassland offset projects across Canada (including both natural grasslands and pasturelands) could contribute to meaningful removals of GHGs from the atmosphere. Permanence, leakage, and additionality issues can likely be minimized through proper program design, including through the use of discount factors. Based on these considerations, the ECO believes Ontario should develop a grassland offset protocol.

4.6.6 Anaerobic Digestion and Organic Waste Management Projects

Anaerobic Digestion

Ontario's proposed anaerobic digestion protocol aims to reduce GHG emissions from the province's waste and agricultural sectors by diverting and anaerobically digesting organic waste and wastewater products and livestock manure.

Anaerobic digestion involves the breaking down of organic material in the absence of oxygen. This process produces biogas (which consists mainly of methane), that can either be destroyed or used as a fuel source.

While California has an existing protocol that deals with the anaerobic treatment of manure on dairy cattle and swine farms, and Quebec has an existing protocol for methane destruction from covered manure storage facilities, the protocol being developed jointly by Ontario and Quebec would include additional waste streams from a broader scope of sources.

From 1990-2015, GHG emissions from wastewater treatment and discharge increased by 22% across Canada.⁷⁴ While this source accounts for a small percentage of Ontario's overall emissions, wastewater treatment and pumping facilities are often among the highest contributors to Ontario municipalities' GHG emissions.⁷⁵ Similarly, emissions from livestock manure management in Canada have increased by 13% in the period 1990-2015, and account for more than 14% of total agricultural emissions.⁷⁶ Harnessing renewable natural gas or minimizing the methane generated by waste and wastewater systems could reduce a significant source of GHGs in the province while displacing fossil fuels.

HARNESSING RENEWABLE NATURAL GAS COULD REDUCE A SIGNIFICANT SOURCE OF GHGS



provide additional cash flow to rural parts of Ontario to offset the costs of cap and trade. See the ECO's 2017 Annual Energy Conservation Progress Report, *Every Drop Counts: Reducing the Energy and Climate Footprint of Ontario's Water Use*, for further discussion of the potential for wastewater applications in Ontario.

The anaerobic digestion of organic matter can also improve nutrient uptake when the digested slurry is added to crops (as opposed to undigested slurry), allowing for reduced use of synthetic fertilizers and improving crop productivity. And digesting manure and organics can greatly reduce odour levels, which benefits operators and neighbouring properties alike.



Ontarians Leading the Way: Greenholm Farms

Greenholm Farms in Embro, Ontario is run by Gord Green and his son David. The farm has been in operation since 1843.

In 2012, the family installed a 250 kW anaerobic digester that came into production in January 2013. The system uses off-farm organic waste, which is fed into the digester along with the manure from the farm's 230 head of cattle. Some of the organic waste used by Greenholm Farms includes apple processing waste, expired fruit and vegetables from grocery stores, sugar water from food manufacturing, waste oil from food processing, pet food waste, and coffee grounds from Tim Hortons.

The digestate coming out of the digester is run through a press, producing solids used for animal bedding and liquids used as an organic fertilizer on the farm's fields. The liquid fertilizer still contains all the plant nutrients that were in the original materials, but has a lot less odour and pathogens.

The power produced by the digester at Greenholm Farms is sold through a Feed-in Tariff contract to



Photo credit: Gord Green, Greenholm Farms.

the electric grid, and the heat produced from the digester engine is used to heat a shop, the Green family house, and various rooms in their barn, in addition to supplying hot water. The Greens recently signed another 250 kW Feed-in Tariff contract and are now in the process of building a second digester and power plant.

The anaerobic digester system at Greenholm Farms shows the many co-benefits that can arise for these types of projects.

RATING:

Because of the range of co-benefits associated with this project type and low level of regulatory risks, the ECO believes the government should move forward with anaerobic digestion projects in Ontario's offset program. The ECO also strongly encourages the government to include food waste and waste streams from municipal wastewater facilities in its definition of project eligibility to maximize organics capture and methane destruction.

Organic Waste Management

As already noted, the decomposition of organic matter in landfills produces close to 22% of Canada's methane emissions.⁷⁷ Experts warn that the accumulation of solid organic waste is reaching critical levels in almost all areas of the world. Close to half of the world's solid waste is compostable. While Ontario has regulations in place to capture some methane from decomposing organic waste in large landfills, an organic waste management protocol could help divert waste away from landfills and direct it instead to either composting or biomass energy applications.

Composting converts a portion of organic waste into more stable soil carbon, while at the same time preserving the moisture and nutrients found in the original waste product. Diverting waste, instead of allowing it to fill Ontario's landfills, gives offset project proponents the opportunity to sequester carbon in soil while also creating a nutrient-rich fertilizer for use in further agricultural applications. Aside from composting, the use of organic waste as biomass for energy applications could provide another source of non-fossil fuel energy for Ontarians.

The potential for climate change mitigation through improved organic waste management is high: if concerted efforts are made to reduce landfilling around the globe, the Intergovernmental Panel on Climate Change estimates that more than 1,000 Mt CO_2e in emissions could be avoided by 2030, with that number potentially rising to 2,300 Mt CO_2e by 2050.⁷⁹

Despite its climate mitigation potential, the organic waste management protocol could run into additionality issues, at least for projects located in Ontario. The Strategy for a Waste-Free Ontario complements the new legislative and regulatory frameworks for waste diversion introduced over the past year, and commits the province to moving aggressively toward a zero-waste system.



Photo credit: Creative Commons, CC0 1.0 Universal (CC0 1.0).

The strategy introduces a new target of 80% diversion by 2050, and eventually zero waste. Key actions include implementing an Organics Action Plan. While the details have yet to be finalized, the government has indicated it will act to reduce food and organic waste going to disposal, support processing capacity, and stimulate end-markets for food and organic waste. Depending on the legal force of the government's new policy framework, organic waste management offset projects registered in Ontario's offset program could run into challenges around additionality.

One way to avoid additionality issues as a result of Ontario's new waste diversion framework could be to allow credits for projects that start before the regulatory ban, similar to the approach proposed for projects under California's dairy manure management protocol.

Leakage and permanence problems are unlikely to arise with respect to organic waste management projects. Some of the co-benefits associated with waste management projects include the creation of jobs supported by revenue from offset credits, new sources of non-fossil fuel energy, and/or potential revenue from



THE ACCUMULATION OF SOLID ORGANIC WASTE IS REACHING CRITICAL LEVELS IN ALMOST ALL AREAS OF THE WORLD



compost products generated by activities under the protocol. The use of compost generated by these projects could in turn help to improve soil health and productivity, therefore contributing to greater climate resilience.

Neither Quebec nor California has an existing organic waste management protocol, meaning that any credits generated by these projects would be new to the WCI market.

RATING:

The high climate mitigation potential of improved organic waste management, together with the numerous ecological and socio-economic co-benefits that could flow from these projects, make this a desirable protocol to pursue. The government should manage additionality concerns for projects located in Ontario by allowing credits for projects that begin to divert organic waste from landfill before the proposed organics ban comes into effect.

4.6.7 Forest Projects

Trees and other plants naturally sequester carbon, i.e., take it out of the atmosphere. Forest ecosystems store this carbon in living plant tissue, forest litter, and soil. These ecosystems can be either a net source or sink of carbon, depending on the forest's age profile, species composition, growing conditions (e.g., climate and nutrient availability), natural disturbances (e.g., damage by fire and insects) and human disturbances (e.g., forest management/logging/harvesting).

Forest offset protocols are intended to quantify the net climate benefits of activities that are intended to sequester (store) additional carbon in forests. At the time of writing, about 72% of California's offset credits are forest offsets,⁸⁰ and this type of offset could become just as popular in Ontario. Under the linking agreement, Ontario emitters are allowed to use offset credits created under Quebec and California forestry offset protocols.

The Ontario government is proposing three types of Ontario-registered forest offset protocols:

- Forest protocol (including avoided conversion and improved forest management);
- · Afforestation and reforestation protocol; and
- Urban forest protocol.

No details of these protocols are yet available. The MOECC says it will adapt offset protocols already in place in Quebec and California, in consultation with the Ministry of Natural Resources and Forestry (MNRF) and First Nations communities.



Indigenous-led protest against the program to Reduce Emissions from Deforestation and Forest Degradation (REDD) in Durban, South Africa, 2011.

Photo credit: Orin Langelle, Langelle Photography.

Forest Offsets Are Controversial

Although they can be designed to provide environmental and socio-economic co-benefits, forest offsets are among the most controversial types of offset projects.⁸¹

In the ECO's view, Ontario lacks an adequate scientific basis for forest compliance offsets. Forest ecosystems are highly complex, and there is a great deal of uncertainty about the effects of forest management on GHG emissions.⁸² The MNRF's own discussion paper on forest carbon identifies uncertainties such as "uncertain mitigation benefit" and "potential for unintended consequences."⁸³

The European Union banned the use of forestry project credits to meet GHG compliance obligations under its Emissions Trading System, due to concerns including the high risk of reversibility, high administrative costs, carbon accounting uncertainties and unresolved leakage issues.⁸⁴

Forestry offset projects can also cause serious harm. As noted in section 4.4.2, forest offset projects in developing countries have in some cases led to mass displacement of local populations. Many Indigenous organizations have spoken out against forest offset programs, on the grounds that these programs do not adequately consider the impacts on their communities.

ONTARIO LACKS AN ADEQUATE SCIENTIFIC BASIS FOR FOREST COMPLIANCE OFFSETS



Forestry and Afforestation/Reforestation

The forestry and afforestation/reforestation protocols are intended to assess the net carbon impacts of tree planting, management, and harvesting in forests outside urban areas.

Two types of offset projects are to be addressed in the forestry protocol: *avoided conversion* and *improved forest management*. An *avoided conversion* project requires specific actions to ensure continuous forest cover on a privately-owned forest area that would otherwise be cut down, i.e., converted to non-forest land use.⁸⁵ In contrast, *improved forest management* projects involve altering management practices so that the total carbon stored in the forest and in its wood products increases relative to a baseline.⁸⁶

Afforestation/reforestation projects aim to put a forest back on land that has little, if any, tree cover. The difference between afforestation and reforestation is the length of time that the land has been without tree cover. In the Quebec protocol, afforestation takes place where there has been no forest cover for 10 years or more; reforestation takes place where there has been no forest for a shorter time.⁸⁷

All these projects can include harvesting (logging). Depending on the protocol design, these project types may therefore give rise to similar concerns.



Permanence

Forest offset projects may not permanently sequester carbon because they suffer from a significant risk of carbon loss over time. Aside from the risk of unplanned harvesting, forests can die or burn. Of Ontario's 71 million hectares of forest, almost two million hectares are already damaged annually by insects, disease, forest fires and weather.⁸⁸ With a changing climate, forest loss due to fire is expected to at least double by the end of this century.⁸⁹

California's U.S. Forest Projects offset protocol considers sequestration *permanent* if it lasts 100 years, even though GHGs released into the atmosphere by other emitters, relying on an offset credit, may last longer than that.

Discounts and credit buffer accounts are the methods typically used to hedge against loss of permanence, i.e., the risk that the sequestered carbon may go back into the atmosphere.⁹⁰ For example, the California protocol requires (1) the calculation of a *reversal risk rating* for each forest project, and (2) a proportionate number of offset credits held in a buffer account in case of unintentional loss of the trees and/or soil carbon. Unfortunately, the protocol does not provide a scientific justification for the specific reversal risk ratings and therefore for the size of the buffer. This weakens the credibility of California's forest offset credits, and leaves Ontario without satisfactory guidance to assure the permanence of offset credits that might be created here.

FOREST OFFSET PROJECTS MAY NOT PERMANENTLY SEQUESTER CARBON



Additionality

Additionality is a second major concern with all forest offset projects - particularly the improved forest management projects, which make up the majority of California's forest offset projects. If Ontario decides to create forest offsets, how will it establish project baselines that only allow credits for additional carbon sequestration? As in California, Ontario may use a standard average baseline for each region and forest type. The problem with this is that the carbon held per hectare on working forestlands within a single region and forest type can vary considerably. If baselines are set at, or close to the average for a region and forest type, many lands that happen to hold more than the average carbon level could qualify for offset credits without changing anything. This would not genuinely create additional carbon sequestration.

Leakage

Forest offset projects, particularly those requiring reduced harvest, altered management techniques, or the planting of trees on land already used for something else, are highly vulnerable to the risk of leakage (i.e., the shifting of GHG-emitting activities from one location to another).

For example, afforestation/reforestation projects may claim GHG offsets if they plant trees on land previously used for agriculture (crop production and livestock pasture) or other profitable purposes (e.g., industrial, commercial, recreational and residential use). But if one piece of land is removed from a profitable use to plant trees, what will stop replacement land from being converted to that same use elsewhere? Similarly, if improved forest management projects reduce the supply of wood products from one forest, what will stop more wood being extracted from other forests?

The impact of leakage on GHG mitigation is illustrated in Table 4.2.

IF IMPROVED FOREST MANAGEMENT PROJECTS REDUCE THE SUPPLY OF WOOD PRODUCTS FROM ONE FOREST, WHAT WILL STOP MORE WOOD BEING EXTRACTED FROM OTHER FORESTS?

Table 4.2. Example of the potential effect of leakage on GHG mitigation for forest offsets.

Considerations for forest offset GHG mitigation potential	Offset project that decreases wood harvest in a particular forest
Carbon sequestered in forest	More carbon storage
Carbon sequestered in wood products from that forest	Less carbon storage and landfill methane emissions
Product life cycle emissions ⁹¹	Less emissions
Total GHG mitigation effect without leakage	GHG mitigation
Effect of leakage on harvesting and production	More harvesting and production elsewhere
Total GHG mitigation effect with leakage	Leakage decreases or eliminates GHG mitigation

California uses discounts to account for the risk of leakage.⁹² For example, the California forest protocol states: "The general assumption in this protocol is that for every ton of reduced harvesting caused by a forest project, the market will compensate with an increase in harvesting of 0.2 tons on other lands."⁹³ That is, the California protocol expects 80% of the wood demand

from a newly protected forest to simply vanish and only 20% of that demand to shift elsewhere. The protocol therefore discounts the credits given to a forest offset project by only 20%.⁹⁴

A clear scientific backing for specific leakage estimates is essential to a credible forest offset protocol. But the
California forest offset protocol includes no evidence to support its 20% leakage rate. If demand for forest products:

- remains stable over the lifespan of a forest offset project; and
- · continues to be met,

then any project that reduces harvesting in one place must increase harvesting elsewhere. In this case, what carbon sequestration has been achieved?⁹⁵ Without proof that offset projects reduce wood product demand, it is difficult to justify any discount factor, let alone one that is well below 100%.

Credible research suggests a much higher leakage rate than the 20% estimate used by California. In one study cited by the Intergovernmental Panel on Climate Change (IPCC), leakage from avoided deforestation projects was as high as 92%.⁹⁶

Leakage has been estimated at 41-43% in the Northeast U.S. and 8-16% for the Pacific Northwest



A clear-cut forest block in British Columbia, Canada. The IPCC cites leakage rates reaching 84% when taking into account market effects in both Canada and the continental United States.

THE CALIFORNIA FOREST OFFSET PROTOCOL INCLUDES NO EVIDENCE TO SUPPORT ITS 20% LEAKAGE RATE

U.S.,⁹⁷ based on a model that considers only the leakage taking place within the continental United States.⁹⁸ Leakage estimates increase considerably when a broader geographic scope is used. For example, other research reviewed by the IPCC showed leakage⁹⁹ increasing from 58% to 84% when the scope included Canada as well as the continental United States.¹⁰⁰ If global market effects were included, one would expect leakage to increase even more.

To ensure the credibility of California-registered offset credits used by Ontario emitters, the government should ask the California Air Resources Board to demonstrate the science behind the discount rates used in California's offset protocols.

Photo credit: Shutterstock, 2018.



Photo credit: Shutterstock, 2018.

Sequestering Carbon in Wood Products?

Another concern with forest offsets is: How accurate are the estimates of the carbon sequestered in wood produced from an offset project?

California awards offset credits for carbon in wood products based on an expectation that some of the products will store carbon for at least 100 years, and Ontario forest offset protocols may do the same. In other words, GHG *offsets* credited to a forest project include carbon "sequestered" in some wood products as well as any change in the amount of carbon stored in the forest. Is this proposal based on sound science?

Products made from wood do contain carbon. However, wood products decompose at different rates (e.g., paper products usually decompose faster than solid wood products such as lumber). The California protocol attempts to account for these different decomposition rates, but a significant amount of uncertainty exists as to how long the carbon in wood products will actually remain sequestered, because:

- current forest protocols do not track the individual carbon-storing wood products generated by each offset project for any period, much less 100 years;
- the models used to predict wood product decomposition rates use highly uncertain assumptions (see Ontario example in endnote);¹⁰¹
- no one knows what will happen to specific products when they cease to be used for their original purpose; and
- 4. it is very difficult to make credible predictions about the form of waste management that today's wood furniture or lumber will receive over the next several decades. For example, what will be the percentage capture rate of methane emissions from landfills in 2107?¹⁰²

The ECO cannot conclude that there is sufficient evidence that wood products from Ontario-registered offset projects would reliably sequester carbon permanently, or even for at least 100 years.

HOW ACCURATE ARE THE ESTIMATES OF THE CARBON SEQUESTERED IN WOOD?



Other Important Details Are Missing

Another problem is that estimates of the amount of carbon associated with the production of wood products tend to be incomplete, i.e., they may ignore significant life cycle GHG emissions.

GHGs are released during the entire wood product life cycle, including tree harvesting, wood processing, transportation, waste management, and changes to the biological carbon stored in the soil, trees and wood products. Out of this life cycle, the California forest offset protocol only counts emissions from (1) the forest, (2) wood product decomposition / combustion, and (3) fossil fuel use during site preparation.¹⁰³ This leaves out, for example, fossil fuel used in harvesting, processing and transporting the wood products. This fossil fuel use can be a large fraction of the carbon stored in the wood product. For example, studies of Canadian forest products indicated that 20% to 36% of the carbon stored in wood products is cancelled out by the GHG emissions associated with producing them.¹⁰⁴ The cradle-to-gate GHG emissions of Ontario wood products can be substantial. For example, about one tonne of GHG is released for every tonne of newsprint produced.¹⁰⁵

Excluding the fossil fuel used when producing a wood product is reasonable if the wood is harvested, processed, transported and used entirely in California, where all fossil fuel use is covered by the carbon cap.¹⁰⁶ However, California accepts forest offsets generated throughout the United States, and most U.S. states do not cap GHGs. Ontario is also proposing to register offset projects from all Canadian jurisdictions, many of which do not cap GHGs.

Other potentially significant climate impacts omitted from the California protocol include:

1. the methane that may be emitted during wood chip storage;107

- 2. the black carbon (soot)¹⁰⁸ produced from fossil fuel used in forestry equipment (i.e., for site preparation, harvesting and transportation); and,
- 3. some of the GHG changes that occur in a forest when trees are removed, e.g., changes to carbon in dead wood on the ground, dead plant material, and the forest soil (other than from site preparation).¹⁰⁹

For these reasons, the climate benefits of storing carbon in wood products are likely overestimated in the California protocol.

ONTARIO CLIMATE POLICY IS UNDERMINED BY ITS FISCAL POLICY



Offsets and Fossil Fuel Subsidies

Ontario climate policy is undermined by its fiscal policy, which continues to give tax breaks that subsidize fossil fuel use by various sectors, including forestry.

Offset credits that financially support logging would presumably increase fossil fuel use by the forestry sector and would therefore increase provincial fossil fuel subsidies to that sector. At the same time, these provincial fossil fuel subsidies could help the forestry sector keep the price of its offset credits lower than the cost of competing offset credits from sectors that do not receive a fossil fuel subsidy. The combined effect of these two factors might further increase fossil fuel use in Ontario's forests, again increasing the costs of the fossil fuel subsidy to the government while releasing more black carbon in northern latitudes where it does the most harm.

The ECO is not aware of any research that addresses the potential magnitude of these effects in Ontario.

Credits From Displacing GHG-Intensive Products?

In its forest carbon discussion paper, the MNRF suggests that long-lived wood products mitigate GHGs when they displace more GHG-intensive alternatives (e.g., concrete and steel).¹¹⁰ Wood buildings are likely to have lower life-cycle emissions than buildings of concrete or brick because of the substantial GHG emissions associated with these heavier, thermally processed materials, and because wood is lighter to transport and requires a smaller foundation.

It is appropriate for Ontario to use its regulatory and fiscal tools to encourage increased use of wood and wood products (e.g., cross-laminated timber) to replace materials with larger carbon footprints, such as concrete and steel, while also exploring the use of lower-carbon products. The ECO agrees that Ontario's Building Code should continue to expand the permitted use of wood as a building material. Quebec already permits 12-story wood buildings, and even taller wood structures are being constructed in other jurisdictions, such as British Columbia.

However, displacing GHG-intensive materials should not be eligible for offset credits because the GHGs from Ontario concrete and steel manufacturing are covered by Ontario's GHG cap.

Would Forest Management Reliably Reduce GHGs?

The ECO cannot support the use of forest offsets to incent faster logging or changes in species composition, for the reasons discussed above and because:

 The ECO is not satisfied that forest offset projects would use computer models that accurately represent the diversity, dynamics and harvest regimes used in Ontario's managed forests – essential for ECO CANNOT SUPPORT THE USE OF FOREST OFFSETS TO INCENT FASTER LOGGING OR CHANGES IN SPECIES

a credible forest carbon estimate. There are some indications that the models and assumptions used to inform the MNRF's forest management policies do not adequately represent Ontario forest conditions.¹¹¹ For example, the broad categorization of Ontario forests as uniformly young, middle-aged or old (as in the MNRF's forest carbon discussion paper)¹¹² is problematic, as many Ontario forests are not evenaged¹¹³ and have relatively long fire cycles (over 100 years).¹¹⁴

- 2. An emissions reduction now is far more valuable than one that may take place in 100 years. Yet cutting down older forests might increase emissions for several decades, whether or not a net reduction might eventually be achieved.¹¹⁵
- 3. Even if the science were certain on the GHG mitigation potential of faster logging and species changes, these changes would have other environmental impacts (especially if undertaken at a large scale). Faster logging and species changes could have serious impacts on non-carbon forest benefits, such as wildlife habitat, nutrient cycling, air and water purification, as well as ecotourism. And as the ECO documented in its 2017 Environmental Protection Report, *Good Choices, Bad Choices*, the MNRF is already comprehensively failing to provide adequate protection for Ontario's species at risk, including at least 28 species at risk in the "area of the undertaking" where much commercial forestry takes place.



IT WOULD NOT BE APPROPRIATE TO USE FOREST MANAGEMENT OFFSETS TO POTENTIALLY WORSEN THE OVERALL ENVIRONMENTAL OUTCOMES FOR ONTARIO'S FORESTS AND WILDLIFE



Forest Protocol

It would not be appropriate to use offsets based on the forest protocol to potentially worsen the overall environmental outcomes for Ontario's forests and wildlife, especially because intact healthy forests are essential for Ontario's adaptation to climate change, as well as to Ontario's protected area commitment.¹¹⁶

RATING:

Given (1) the substantial uncertainty associated with the effects of forest management practices on the carbon dynamics and ecology of Ontario's forests, and (2) the failure of forest protocols to adequately address major concerns such as permanence, additionality and leakage, forest management projects should not be eligible to create compliance offsets in Ontario until their substantial ecological and regulatory risks are comprehensively addressed and greater scientific consensus is achieved. The ECO encourages the government to continue its efforts to build a Land Use Carbon Inventory, and to apply Greenhouse Gas Reduction Account funds to finance further research on the role of forests in climate change mitigation.

Afforestation and Reforestation Protocol

Straightforward afforestation and reforestation, with native tree species and without wood harvesting (except as necessary for the health of the forest), has far fewer risks than other forms of forest management. In particular, additionality and leakage of wood harvesting are much less of a concern. There could be greater confidence in permanence if paired with a conservation easement that ensures the land will remain permanently as forest. The risk of displacing agricultural land uses, leading to deforestation elsewhere, can be minimized with appropriate conditions, and there can be obvious advantages for ecological integrity and wildlife habitat.

Accordingly, the ECO cautiously supports an afforestation and reforestation protocol based on the planting of native tree species, secured by a conservation easement, and without wood harvesting except as necessary for the health of the forest. The project should not displace agricultural land uses to a different location.

RATING:

FOREST MANAGEMENT PROJECTS SHOULD NOT BE ELIGIBLE TO CREATE COMPLIANCE OFFSETS IN ONTARIO

4.6.8 Urban Forest Projects

Ontario's proposed urban forest protocol would allow offset project proponents to earn offset credits by planting trees in urban areas. As with other forest offset projects, urban tree projects suffer permanence risks, since severe weather, infestations, and other natural and human variables can cause die-off and release of carbon sequestered. Urban trees may experience higher rates of die-off than trees outside of urban centres; however, such deaths can be readily detected and they can be replanted easily.

The risks associated with urban forest projects are smaller than in other forest offset types. Perverse incentives, leakage, and additionality are not major concerns. Permanence risks can be mitigated through program design, such as enhanced tree inspection, maintenance, and replacement, and the use of buffer credits to make up for tree deaths. It may also be appropriate to limit pre-crediting, and to issue credits as trees grow.

The co-benefits from urban forest projects can be significant. Beyond GHG sequestration, trees in urban areas can:

- cool the air between 2-8 degrees Celsius: this moderation of the urban heat island effect will be increasingly important as the climate warms;
- reduce air conditioning and home heating needs by 20-50% when placed around buildings;
- filter the air to remove urban pollutants;



Figure 4.8. Co-benefits from urban forest offset projects.

Photo credit: Creative Commons, CC0 1.0 Universal (CC0 1.0).

THE CO-BENEFITS FROM URBAN FOREST PROJECTS CAN BE SIGNIFICANT



- improve water quality and regulate water flow, protecting watercourses and limiting demands on stormwater infrastructure;
- increase beauty, create recreational opportunities and decrease stress; and
- provide habitat, food and shelter for urban plants and animals.¹¹⁷

RATING:

Because of the high potential for ecological and socioeconomic co-benefits, and the relatively low regulatory risks associated with urban forest projects, the ECO supports including them in Ontario's offset program.

4.7 Conclusions and Recommendations

Since their debut on the global carbon market, much has been learned about offsets. While there is reason to be cautious about certain offset types, there is also reason to be optimistic about others; some offset protocols can both reduce uncapped GHG emissions (including the potent GHGs methane and nitrous oxide), and provide socio-economic and ecological co-benefits to communities.

Ontario compliance offsets must be supported by clear and convincing evidence. Even in these cases, appropriate safeguards are necessary, including accounting, quantification, and monitoring provisions based on the best available science.

The ECO will continue to monitor the development of protocols and regulations in support of Ontario's offset program. If Ontario "gets it right," the province could see real benefits to local communities and the environment, along with meaningful reductions of emissions in Ontario's uncapped sectors, to offset extra emissions from capped sectors.

- To maximize the co-benefits for Ontarians, the government should, whenever practical, purchase its voluntary offset credits from Ontario-based projects.
- To ensure the credibility of California-registered offset credits used by Ontario emitters, the government should ask the California Air Resources Board to demonstrate the science behind the discount rates used in California's offset protocols.

 The government should only authorize compliance offset protocols that will result in emissions reductions that are real, quantifiable, additional, permanent, verifiable, and assessed for leakage. Even though Ontario emitters are entitled to buy and use offset credits recognized by California and Quebec, Ontario should not simply mimic offset protocols from those jurisdictions. Where California or Quebec has accepted offset protocols that do not meet key regulatory criteria, Ontario should work with its partner jurisdictions to "level up" the protocols in all three jurisdictions.

 The ECO makes the following recommendations with respect to the development of compliance offset protocols:

Proposed Offset Protocol	Rating	Comments
Landfill gas capture and destruction		The ECO recommends that the province move forward with a landfill gas offset protocol, given its potential for local socio-economic co-benefits and some level of climate mitigation.
Mine methane capture and destruction		The ECO recommends that the province proceed with caution in developing a coal mine methane protocol, and commit to working with its WCI partners to monitor any influence that offset revenues may have on North American coal production.
Ozone depleting substances capture and destruction		Given the low potential for regulatory or other concerns, and given the high mitigation potential of ODS offset projects, the ECO recommends that the government proceed with developing an ODS offset protocol.
Refrigeration systems		The ECO recommends proceeding expeditiously with the development of a refrigeration systems protocol. The protocol appears to present negligible regulatory or other concerns, has a high mitigation potential, and may have significant co-benefits for Ontarians.
Conservation cropping		Due to concerns about permanence and additionality, the ECO recommends that the government discontinue developing a conservation cropping protocol for inclusion in Ontario's offset program.
Nitrous oxide reductions from fertilizer management in agriculture		The ECO recommends proceeding with a fertilizer management protocol. If the protocol is carefully drafted, the mitigation potential of these projects, coupled with significant ecological and socio-economic co-benefits, could make these projects worthwhile. The protocol should have sufficient means of accounting for additionality risks and should include provisions for crediting farmers who do not use synthetic fertilizers (or alternatively, the government should provide an equal or better level of government support for such operations).

Emissions reductions from livestock	?	Overall, because very little is known about the proposed enteric fermentation offset protocol, the ECO does not have enough information to provide a rating or make an informed assessment of its relative merits and demerits. If such a protocol is developed, it will need to consider the full impacts of these types of projects on a suite of social and ecological values.
Grassland projects		The ECO recommends proceeding cautiously in the development of a grassland protocol. Permanence, leakage, and additionality issues can likely be minimized through proper program design, including through the use of discount factors, and the co-benefits associated with these projects are wide ranging.
Anaerobic digestion		Because of the range of co-benefits associated with this project type and low level of regulatory risks, the ECO recommends the government move forward with anaerobic digestion projects in Ontario's offset program. The ECO also strongly encourages the government to include food waste and waste streams from municipal wastewater facilities in its definition of project eligibility to maximize organics capture and methane destruction.
Organic waste management		The high climate mitigation potential of improved organic waste management, together with the numerous ecological and socio- economic co-benefits that could flow from these projects, make this a desirable protocol to pursue. The government should pursue the development of an organic waste management protocol, but should manage additionality concerns for projects located in Ontario by allowing credits for projects that begin to divert organic waste from landfill before the proposed organics ban comes into effect.
Forest management		The ECO recommends against including forest management projects in Ontario's compliance offset program until their substantial ecological and regulatory risks are comprehensively addressed and greater scientific consensus is achieved. The ECO encourages the government to continue in its efforts to build a Land Use Carbon Inventory, and to apply Greenhouse Gas Reduction Account funds to finance further research on the role of forests in climate change mitigation.
Afforestation and reforestation		The ECO cautiously supports an afforestation and reforestation protocol based on the planting of native tree species, secured by a conservation easement, and without wood harvesting except as necessary for the health of the forest. The project should not shift agricultural land uses to a different location.
Urban forest projects		Because of the high potential for ecological and socio-economic co- benefits, and the relatively low regulatory risks associated with urban forest projects, the ECO recommends that the government include them in Ontario's offset program.

Endnotes

- Large Final Emitters identified as emissions intensive or trade exposed are obtaining most of their allowances free of charge for the first compliance period of the program. Providing allowances free of charge is a transitional measure, and Ontario has noted it intends to re-assess this for future compliance periods.
- The word "project" is used throughout this report to describe offset projects for the purposes of Ontario's offset program. The Ontario government's proposed Ontario Offset Credits Regulation refers to offset projects as "offset initiatives", but for the purposes of this report, the two terms are equivalent.
- 3. The same analysis applies to landfills, if the landfill does not already capture its methane, and if the landfill is not required by law to do so.
- In 2016, the average price of international offsets traded on the voluntary market was US \$3/tonne of CO₂e. See Ecosystem Marketplace, Unlocking Potential, State of the Voluntary Carbon Markets 2017 (Washington: Forest Trends' Ecosystem Marketplace, 2017) at 7, online: <u>http://forest-trends.org/releases/p/sovcm2017</u>. [Accessed November 10, 2017]
- Environment and Climate Change Canada, National Inventory Report 1990-2015: Greenhouse Gas Sources and Sinks in Canada, Part 3 (Ottawa: ECCC, 2017) at 59.
- Environment and Climate Change Canada, National Inventory Report 1990-2015: Greenhouse Gas Sources and Sinks in Canada, Part 3 (Ottawa: ECCC, 2017) at 59. Forestry emissions, beyond pulp and paper industry operations, are not counted under Ontario's totals.
- For instance, according to the IPCC's Fifth Assessment Report, methane's global warming potential over a 20-year timescale is 86 times greater than that of CO₂ (Myhre, GD et al, "Anthropogenic and Natural Radiative Forcing" in *Climate Change 2013: The Physical Science Basis*. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (Geneva, Switzerland: IPCC, 2013) at 714).
- 8. Rural Ontarians typically pay higher home heating costs than those living in urban centres due to the cost of delivering energy to rural and remote communities. Additionally, the increased cost of fuel for transport under cap and trade will be felt more by rural communities, many of which do not have the transit options that larger centres offer. Rural Ontarians have also noted that many of the proposed uses of cap and trade revenues will be for primarily urban initiatives such as transit projects and electric vehicle incentives.
- Cities produce about 70% of energy-related GHG emissions, despite making up less than 2% of global land area (see for example Wanli Fang, "How Cities Can Save Trillions, Curb Climate Change, and Improve Public Health" *World Resources Institute* (September 17, 2014), online: http://www.wri.org/blog/2014/09/how-cities-can-save-trillions-curbclimate-change-and-improve-public-health). [Accessed November 10, 2017]
- 10. For example, many Gold Standard projects focus on reducing black carbon, e.g., through clean cookstoves that burn biomass. Black carbon is a short-term climate forcer with significant human health effects, but it is not part of the Paris Agreement or of countries' GHG-reduction commitments. Thus, black carbon reduction would not be eligible for GHG compliance offsets, but is an excellent target for voluntary offsets.

- Averaging \$3/tonne CO₂e in 2016, according to Ecosystem Marketplace, Unlocking Potential, State of the Voluntary Carbon Markets 2017 (Washington: Forest Trends' Ecosystem Marketplace, 2017) at 7, online: <u>http://forest-trends.org/releases/p/sovcm2017</u>. [Accessed September 27, 2017]
- 12. In the same way, the ECO purchases our electricity and heating from Bullfrog Power, paying a premium so as to reduce our climate debt.
- 13. Alberta has taken a similar approach, allowing only Alberta-based offsets to be used in its compliance offsetting program.
- 14. Many national and subnational governments, including those of New Zealand, China, South Korea, the European Union, California, and a coalition of New England States (the Regional Greenhouses Gas Initiative), have all developed compliance offset programs. Hundreds of thousands of technical and scientific papers have been written about the opportunities and potentialities of different carbon offsets, and while some NGOs have spoken out against offsetting, many have voiced their support for offsets in climate mitigation plans. For instance, the Gold Standard website lists 82 NGOs as supporters of Gold Standard offsets, including the World Wildlife Fund, Carbon Watch, the David Suzuki Foundation, the Pembina Institute, and the Rainforest Alliance (Gold Standard, "Our Partners & Supporters" (2015) online: https://www.goldstandard.org/our-story/partners-supporters. [Accessed November 10, 2017])
- 15. It is important to note that differences exist between the various carbon markets on which offsets are sold, and depending on program design, the concerns detailed in this section may not manifest to the same extent in the Western Climate Initiative (WCI) market. However, Ontario should be alive to these concerns to avoid the pitfalls experienced by other offset programs.
- Another component of the CDM additionality analysis is called a "barrier test," which considers non-financial barriers to adoption of emissionsreduction technology and practice.
- Öko-Institut e.V., How additional is the Clean Development Mechanism? Analysis of the application of current tools and proposed alternatives (Berlin: Öko-Institut e.V., March 2016) at 11, online: <u>https://ec.europa.eu/clima/sites/clima/files/ets/docs/clean_dev_mechanism_en.pdf</u>. [Accessed November 10, 2017]
- 18. Stockholm Environment Institute, Has Joint Implementation reduced GHG emissions? Lessons learned for the design of carbon market mechanisms (Stockholm: Stockholm Environment Institute, August 2015) at 101-102, online: SEI https://www.sei-international.org/mediamanager/documents/Publications/Climate/SEI-WP-2015-07-JI-lessons-for-carbon-mechs.pdf. [Accessed November 10, 2017] Because JI credits are used to justify GHG emissions from participants in the international cap and trade market, the finding that the majority of these credits represented non-additional emissions reductions means that their use enabled emitters to continue to release hundreds of tonnes of CO₂e without truly offsetting them with genuine reductions elsewhere. Thus, the Stockholm Environment Institute concluded that the use of JI may have allowed global GHG emissions to rise approximately 600 million tonnes CO₂e higher than they would have if emitters had met their emissions cuts domestically (*lbid*).

- Stockholm Environment Institute, Has Joint Implementation reduced GHG emissions? Lessons learned for the design of carbon market mechanisms (Stockholm: Stockholm Environment Institute, August 2015) at 9, online: SEI <u>https://www.sei-international.org/mediamanager/ documents/Publications/Climate/SEI-WP-2015-07-JI-lessons-forcarbon-mechs.pdf</u>. [Accessed November 10, 2017]
- Instituto BV Rio, "Brazil and the CDM: Defrauding Investors, Cheating the Atmosphere?" (November, 2017), online: <u>http://bvrio.org/ publicacoes/</u>. [Accessed December 5, 2017]
- 21. This time marker was chosen by the WCI based on the international standard established by the UNFCCC and represents the foreseeable period during which there will continue to be too much carbon in the atmosphere. Note, however, that some offset programs pursue methodologies that do not adhere to the standard definition of 100-year permanence. Despite the challenges associated with such a long sequestration requirement, it doesn't appear that the 100-year time marker has deterred proponents from establishing forest offsets, as evidenced by the large number of these projects in California.
- 22. Note that this is not the same as a "forward offset contract" such as an Emission Reduction Purchase Agreement (ERPA), which is an agreement to purchase offset credits in the future once the emissions reductions are realized.
- 23. Double counting can take many forms, the two most relevant being double claiming, on the one hand, and double issuance, on the other. In a double claiming scenario, an emissions reduction is claimed by both the jurisdiction issuing the emissions-reduction instrument (e.g., an offset credit) and by the jurisdiction where the reduction is taking place (e.g. the location where the offset initiative is located). In double issuance, two jurisdictions issue compliance instruments (such as offset credits) for the same reduction under their respective emissions trading systems.
- 24. However, this can also be a problem within the design of an individual cap and trade program. For example, if offset credits were awarded for the installation of solar panels when upstream energy is included under a jurisdiction's cap, this would result in double counting of emissions reductions.
- Chris Lang & Timothy Byakola, 'A funny place to store carbon': UWA-FACE Foundation's tree planting project in Mount Elgon National Park, Uganda (Montevideo: World Rainforest Movement, 2006), online: <u>http://wrm.org.uy/oldsite/countries/Uganda/Place_Store_Carbon.pdf</u>. [Accessed September 27, 2017]
- Chris Lang & Timothy Byakola, 'A funny place to store carbon': UWA-FACE Foundation's tree planting project in Mount Elgon National Park, Uganda (Montevideo: World Rainforest Movement, 2006), online: http://wrm.org.uy/oldsite/countries/Uganda/Place Store Carbon.pdf. [Accessed November 10, 2017]; Heinrich Boll Stiftung, "License to pollute – Carbon markets and the new economy of nature" *Tipping Point Podcast Series* (April 2017) at 7:45-9:00, online: <u>https://soundcloud.com/</u> <u>boellstiftung</u>. [Accessed September 27, 2017]

For further information see Connor Cavanagh & Tor A Benjaminsen, "Virtual nature, violent accumulation: The 'spectacular failure' of carbon offsetting at a Ugandan National Park" (2014) 56 *Geoforum* 55; Victoria Tauli-Corpuz & Aqqaluk Lynge, "Impact of Climate Change Mitigation Measures on Indigenous Peoples and On Their Territories and Lands" (submitted to the United Nations Economic and Social Council at the Seventh Session of the Permanent Forum on Indigenous Issues, April 21-May 2, 2008); and Himmelfarb, David Karl, *In the Aftermath of Displacement: A Political Ecology of Dispossession, Transformation, and Conflict on Mt. Elgon, Uganda* (Doctor of Anthropology, University of Georgia, 2012) [unpublished], online: <u>https://getd.libs.uga.edu/pdfs/himmelfarb_david_k_201208_phd.pdf</u>. [Accessed November 10, 2017] There are ongoing concerns about further evictions by the Ugandan Ministry of Lands as the government moves to open boundaries around Mount Elgon National Park: NTV Uganda, "Mt. Elgon national park boundary demarcation worries the Benet people" (15 June 2017) *NTV Uganda*, online: <u>http://ntv.co.ug/news/local/15/jun/2017/</u>mt-elgon-national-park-boundary-demarcation-worries-benet-people_17775#sthash.EQbXPvW3.dpbs</u>. [Accessed November 10, 2017]

 Friends of the Earth, A Dangerous Distraction: Why Offsetting is Failing the Climate and People – The Evidence (London: Friends of the Earth England, Wales and Northern Ireland, 2009) at 4, online: <u>https://www. foe.co.uk/sites/default/files/downloads/dangerous_distraction.pdf</u>. [Accessed September 27, 2017]

Many of the concerns expressed by Friends of the Earth seem to be closely tied to the CDM and the issues that arise in international offsetting, where industrialized countries are not undertaking their own mitigation efforts. For this reason, the report has less relevance to Ontario's proposed use of offsets for uncapped sectors in its cap and trade system.

28. Concerns have arisen with respect to the justice implications of offsets in North America. In both Canada and the United States, there exists a significant body of literature on "environmental racism" (see for example Laura Pulido, "Rethinking Environmental Racism: White Privilege and Urban Development in Southern California" (2000) 90:1 Annals of the Association of American Geographers 12; Luke W Cole & Sheila R Foster, From the Ground Up: Environmental Racism and the Rise of the Environmental Justice Movement (New York: NYU Press, 2001); Rachel D Godsil, "Remedying Environmental Racism" (November 1991) 90:2 Michigan Law Review 394; and Michael Mascarenhas, Where the Waters Divide: Neoliberalism, White Privilege and Environmental Racism in Canada (New York: Lexington Books, 2012). This term describes the disproportionate placement of environmental harms (such as increased exposure to toxic pollutants), on low-income and racialized communities.

For instance, residents of Aamjiwnaang First Nation near Sarnia, Ontario, live next to industrial facilities that account for approximately 40% of Canada's petrochemical industry, an area commonly referred to as "Chemical Valley." The facilities in Chemical Valley collectively emit tens of millions of kilograms of air pollutants each year, which has resulted in direct health effects to Aamjiwnaang community members (see for example Basu, N et al, Multiple Chemical Exposure Assessment at Aamiiwnaang, McGill Environmental Health Sciences Lab Occasional Report 2013-1 (2013) at 12, which found that members of Aamjiwnaang First Nation are exposed to above average levels of cadmium, mercury, perfluorinated compounds, and polychlorinated biphenyl, among other harmful substances). Exposure to air pollutants has led to reports of high rates of asthma: high blood pressure: severe and chronic headaches: learning and behavioural problems in children; skin rashes; and miscarriages and stillbirths (Ecojustice, Exposing Canada's Chemical Valley (October 2007) at 9, online: https://www.med.uottawa.ca/sim/ data/Images/Env_Health_Sarnia_air_pollution_report.pdf). [Accessed November 10, 2017]

Many studies also indicate that climate change is likely to disproportionately impact on low-income communities, both in North America and around the world (see for example the UN's *World Economic and Social Survey 2016: Climate Change Resilience*–An Opportunity for Reducing Inequalities (2016), online: <u>https://wess.</u> <u>un.org/wp-content/uploads/2016/06/WESS 2016 Report.pdf</u> [Accessed September 27, 2017] which finds that climate change will continue to take the largest toll on poor and vulnerable people). While GHGs are emitted from localized sources, unlike air pollutants, their impact is global and cumulative: the GHGs emitted from one facility do not have a point source impact.

In the context of cap and trade, a study released by the University of Southern California (USC) shows an ostensible link between the emission of GHGs and of criteria air pollutants by industrial facilities. The study suggests that there is a correlation between how many GHGs a facility emits, and how much particulate matter is emitted concomitantly. While most GHGs do not cause direct harm to human health, the "copollutants" emitted by the same industrial facilities do.

These findings have been used to support criticisms of offsets in California. According to the study, between 2013 and 2014, more offset credits were used than the total reduction in allowable GHG emissions for capped emitters in the state. Most offset credits used in this time period were generated by projects outside of California. As a result, the use of offsets is seen as allowing facilities to maintain or increase instate emissions of both GHGs *and* co-pollutants, the former contributing to the broader problem of climate change, and the latter directly affecting the health of low-income and racialized communities.

While concerns about the impacts of climate change and pollution on marginalized groups are both valid, the link between the emission of GHGs and other criteria air pollutants is not so clearly defined. Some facilities (such as petrochemical plants) may release large amounts of both GHGs and other types of toxic pollutants, but there are also types of capped emitters that don't. For instance, car assembly plants and universities are capped emitters under Ontario's cap and trade system. Emissions from these sources are predominantly attributable to their electricity use, which comes from the provincial grid. Because Ontario's grid is among the cleanest in North America, there are very few air pollutants directly or indirectly associated with the GHGs emitted by these facilities.

Even for facilities that emit both criteria air pollutants and GHGs, it is not as simple as saying that reducing GHGs at capped facilities (rather than allowing facilities to offset their GHG emissions) will result in less air pollution. Often, the technology required to capture air pollution (such as thermal oxidizers used to decompose particulate and volatile organic compounds at high temperature) will *increase* a facility's GHG emissions compared with an uncontrolled system. In this sense, the link between GHGs and air pollutants is decoupled.

The need to reduce GHG emissions under cap and trade should not be conflated with the need for more stringent air quality standards and better regulation of air pollutants that directly impact on the health of communities. The ECO believes that the operation of cap and trade to reduce GHGs can and should run in tandem with better policies and regulations on air pollution. To read more about the USC study on the link between GHG emissions and air pollutants, and the impacts of both on marginalized communities, see Madeline Wander, "The Climate Gap and Cap-and-Trade in California" (2 March 2017), online: <u>http://</u> <u>calbudgetcenter.org/wp-content/uploads/Policy-Insights-2017-Wander.</u> <u>pdf</u>. [Accessed November 10, 2017]

- 29. The project has been widely praised by local and international governmental, non-governmental and journalistic sources: Joy Nabukeya, "Carbon offset project boosts conservation of Kenyan mangroves" Coastweek.com (9 May 2017), online: http://www. coastweek.com/4017-Carbon-offset-project-boosts-conservation-of-Kenya-mangrove-forests.htm [Accessed November 10, 2017]; Free Speech Radio News, "Kenyan community project restores mangroves while selling carbon credits" FSRN (7 March 2017), online: https://fsrn. org/2017/03/kenyan-community-project-restores-mangroves-whileselling-carbon-credits/ [Accessed November 10, 2017]; Moraa Obiria, "Protecting mangroves, Kenya's fishermen net cash - and more fish" Thomson Reuters Foundation (27 September 2016), online: http://news. trust.org/item/20160927120410-sr9t5/ [Accessed November 10, 2017]; Anthony Langat, "The coastal Kenyan villages bringing their mangrove forest back to life" The Guardian (22 February 2016), online: https:// www.theguardian.com/global-development-professionals-network/2016/ feb/22/the-coastal-kenyan-villages-bringing-their-mangrove-forest-backto-life [Accessed November 10, 2017]; Winifred Bird, "From Senegal to Indonesia, conservation groups are linking coastal restoration to the climate change movement" Earth Island Journal (10 April 2017). online: http://www.earthisland.org/journal/index.php/elist/eListRead/ in photos blue carbon around the world/ [Accessed November 10, 2017]; Moraa Obiria, "Fishermen in Kilifi net cash and more fish from protecting mangroves" Thomson Reuters (28 October 2016), online: http://www.the-star.co.ke/news/2016/10/28/fishermen-in-kilifi-netcash-and-more-fish-from-protecting-mangroves_c1445177 [Accessed November 10, 2017]; Alloys Musyoka, "Kwale group earns millions from model Redd project" The Star (8 January 2016), online: http:// www.the-star.co.ke/news/2016/01/08/kwale-group-earns-millionsfrom-model-redd-project_c1257282 [Accessed November 10, 2017]; Alloys Musyoka, "Villagers and scientists join hands in unique mangrove project" The Star (26 February 2016), online: http://www.the-star. co.ke/news/2016/02/26/villagers-and-scientists-join-hands-in-uniquemangrove-project_c1297586 [Accessed November 10, 2017]. However, some spokespeople for small-scale fishers continue to oppose "blue carbon" schemes on the basis that they encourage the commodification of nature (see Carla McKirdy, "Blue carbon schemes: conserving coastal areas or commodifying nature?" The Guardian (22 February 2016), online: https://www.theguardian.com/global-development-professionalsnetwork/2016/feb/22/blue-carbon-schemes-conserving-coastal-areasor-commodifying-nature) [Accessed November 10, 2017]. See also Climate Analytics, "The Dangers of Blue Carbon Offsets: From Hot Air to Hot Water?" (November 2017), online: http://climateanalytics.org/ publications/2017/the-dangers-of-blue-carbon-offsets-from-hot-air-tohot-water.html. [Accessed November 21, 2017]
- Examples of stakeholder consultation include public meetings or the drafting of questionnaires seeking feedback from those who want to have a say in a project.
- For sequestration projects, crediting periods are expected to last 30 years; for non-sequestration projects, crediting periods are expected to last 10 years.

- 32. Environment and Climate Change Canada, National Inventory Report 1990-2015: Greenhouse Gas Sources and Sinks in Canada, Part 1 (Ottawa: ECCC, 2017) at 51. Ontario has implemented regulations for some of the province's largest landfills, and has taken steps to reduce landfill gas (LFG) emissions through the new Resource Recovery and Circular Economy Act, 2016. However, even with these measures in place, methane emissions from landfills could still continue to rise. This is because even with recent reductions in solid waste (through composting and waste management measures), the solids placed in landfills in past years will continue to release methane for decades (these are referred to as historical emissions).
- 33. Ontario and Quebec both have regulations establishing the requirement to capture landfill gas emissions for landfills of a certain size. Regulation 232/98 under the Ontario *Environmental Protection Act* requires that any new landfill or expansion to an existing landfill with a designed capacity of greater than 1.5 million cubic metres must prepare a plan to collect and burn or use LFG generated during site operation and following closure (*Landfilling Sites*, O Reg 232/98). Regulation 347 imposes the same requirement for sites not subject to Regulation 232/98 (see Regulation 347, RRO 1990, ss 11 to 11.5). Quebec's *Environmental Quality Act* and regulations impose similar requirements for the collection and destruction of methane emissions at landfills (see Regulation respecting the landfilling and incineration of residual materials, Environmental Quality Act, Q-2, r 19, s 32).

Beyond these two provinces, British Columbia's Landfill Gas Management Regulation establishes requirements for the flaring or collection of landfill gases in the province. While Alberta does not require collection or flaring of LFG from active sites, the Alberta Standards for Landfills require landfill owners or operators to develop contingency plans for the mitigation of subsurface landfill gas migration as well as post-closure landfill gas control systems. Manitoba's Climate Change and Emissions Reductions Act, SM 2008, c 17, requires owners and operators of prescribed landfills (those with more than 750,000 tonnes of waste in place) to submit and implement plans to control, collect or use landfill emissions before they are released into the atmosphere both during operation of the landfill and after it is closed (see section 15). Nova Scotia doesn't strictly require capture or flaring, but has a set of Municipal Solid Waste Landfill Guidelines that require LFG to be collected and/or vented from existing landfills for safety reasons (not energy recovery), and require all new landfills to be assessed for viability of LFG recovery and utilization (see page 9). Similarly, PEI's Waste Resource Management Regulations require LFG management, including the installation of venting or gas collection systems to control and monitor LFG production at landfills, and the assessment of all new landfills for viability of energy recovery from gas production (section 22). For more information on waste management regulations across Canada, see Giroux Environmental Consulting, "State of Waste Management in Canada" (2014) Exhibit 33, online: http://www.ccme.ca/files/Resources/ waste/wst_mgmt/State_Waste_Mgmt_in_Canada%20April%202015%20 revised.pdf. [Accessed November 10, 2017]

34. For the purposes of the proposed LFG Protocol, this means the landfill must receive less than 50,000 tonnes of residual materials annually and have a maximum capacity of less than 1,500,000 cubic metres.

- 35. This approach has been advocated by the Ontario Waste Management Association for large landfills currently exempt from participating under the proposed Landfill Gas Protocol (see Ontario Waste Management Association, "OWMA raises concerns about Ontario's Landfill Gas Offset Protocol" (28 June 2017) online: OWMA <u>http://www.owma.org/articles/ owma-highlights-missed-opportunity-on-landfill-gas-offset-protocol</u>). [Accessed November 10, 2017]
- Less, "Featured Project: FRSWC's Landfill Gas Management System" online: <u>https://www.less.ca/projects/lessprojects.cfm</u>. [Accessed November 10, 2017]
- 37. Gas collection rates can be up to 75% for basic landfills, and up to 95% for engineered sanitary landfills (Öko-Institut e.V., *How additional is the Clean Development Mechanism? Analysis of the application of current tools and proposed alternatives* (Berlin: Öko-Institut e.V., March 2016) at 117).
- Noim Uddin et al, "Sustainable Development Outcomes of Coal Mine Methane Clean Development Mechanism Projects in China" (2015) 45 *Renewable and Sustainable Energy Reviews* 1 at 3.
- Most methane producing mines continue to release emissions for several decades (see US EPA Coalbed Methane Outreach Program, Methane Emissions from Abandoned Coal Mines in the United States: Emission Inventory Methodology and 1990-2002 Emissions Estimates (2014) at 10, online: <u>http://www.epadatadump.com/pdf-files/amm_final_report.pdf</u>). [Accessed November 10, 2017]
- However, there may still be a risk of over-crediting that needs to be addressed in measurement and accounting methodologies (Öko-Institut e.V., How additional is the Clean Development Mechanism? Analysis of the application of current tools and proposed alternatives (Berlin: Öko-Institut e.V., March 2016) at 10, 13 & 17). [Accessed November 10, 2017]
- California Air Resources Board, "The Mine Methane Capture Protocol and Mining Economics" (March 2014), online: <u>https://www.arb.ca.gov/ regact/2013/capandtrade13/1mmcecon.pdf</u>. [Accessed November 10, 2017]
- World Resources Institute & World Business Council for Sustainable Development, "Global Warming Potential Values" (2016) online: <u>http://www.ghgprotocol.org/sites/default/files/ghgp/Global-Warming-Potential-Values%20%28Feb%2016%202016%29_1.pdf</u>. [Accessed November 10, 2017].
- 43. According to Environment and Climate Change Canada, the *Regulations:*Implement the phase-out schedule for consumption and production of HCFCs in accordance with the *Montreal Protocol*;
 Create a manufacturing allowance system to phase out HCFC
 - Oreate a manufacturing anowance system to phase out HCFC manufacturing in Canada;
 Prohibit the import and manufacture of HCFCs to be used as fire-

Establish a permitting and reporting system to monitor the import,

manufacture and export of HFCs.

 Regulatory Impact Analysis Statement, Ozone-depleting Substances and Halocarbon Alternatives Regulations, "PC: Regulatory Impact Analysis Statement" (21 March 2015) C Gaz I, vol 149, no 12, online: <u>http://www. gazette.gc.ca/rp-pr/p1/2015/2015-03-21/html/reg1-eng.php</u>. [Accessed November 10, 2017]

- According to Drawdown, refrigerant recovery has "immense mitigation potential" (Paul Hawken, ed, *Drawdown: The most comprehensive plan ever proposed to reverse global warming* (New York: Penguin Books, 2017) at 165).
- 46. HFCs do not contain chlorine, so their ozone-depleting potential is zero.
- World Resources Institute & World Business Council for Sustainable Development, "Global Warming Potential Values" (2016) online: <u>http://www.ghgprotocol.org/sites/default/files/ghgp/Global-Warming-Potential-Values%20%28Feb%2016%202016%29_1.pdf</u>. [Accessed November 10, 2017]
- Paul Hawken, ed, *Drawdown: The most comprehensive plan ever* proposed to reverse global warming (New York: Penguin Books, 2017) at 165.
- Statistics Canada, "2016 Census of Agriculture" (2017) online: Statistics Canada <u>https://www.statcan.gc.ca/daily-quotidien/170510/dq170510aeng.htm?indid=10441-3&indgeo=0</u>. [Accessed November 10, 2017]
- Richard T Conant et al, "Impacts of Periodic Tillage on Soil C Stocks: A Synthesis" (2007) 95 Soil and Tillage Research 1 at 1.
- See for example David S Powlson et al, "Limited Potential of No-Till Agriculture for Climate Change Mitigation" (30 July 2014) 4 Nature Climate Change 678 at 679 and 680.
- Drawdown, "Food: Conservation Agriculture" online: Drawdown <u>http://www.drawdown.org/solutions/food/conservation-agriculture</u>. [Accessed November 10, 2017]
- David S Powlson et al, "Limited Potential of No-Till Agriculture for Climate Change Mitigation" (30 July 2014) 4 Nature Climate Change 678 at 680.
- Drawdown, "Food: Conservation Agriculture" online: Drawdown http://www.drawdown.org/solutions/food/conservation-agriculture. [Accessed November 10, 2017] Many scientists believe that estimates of sequestration potential in agricultural offsets are widely overstated. See for example Cheryl Palm et al, "Conservation Agriculture and Ecosystem Services: An Overview" (2014) 187 Agriculture, Ecosystems and Environment 87 at 87.
- 55. See the ECO's 2016 report, *Putting Soil Health First: A Climate-Smart Idea for Ontario, 2016 Special Report* (Toronto: ECO, November 2016).
- Alberta Climate Change Office, "Alberta's Climate Leadership Plan" (presentation, 26 September 2017) slides 19-20.
- Environment and Climate Change Canada, National Inventory Report 1990-2015: Greenhouse Gas Sources and Sinks in Canada, Part 1 (Ottawa: ECCC, 2017) at 70-71.
- Environment and Climate Change Canada, National Inventory Report 1990-2015: Greenhouse Gas Sources and Sinks in Canada, Part 1 (Ottawa: ECCC, 2017) at 70-71.
- Kasey Krifka, "Crediting Farmers for Nutrient Stewardship: Assessment by the Climate Trust" *The Climate Trust* (28 October 2015), online: https://www.climatetrust.org/crediting-farmers-for-nutrient-stewardshipassessment-by-the-climate-trust/. [Accessed November 10, 2017]

- 60. The organization Drawdown estimates that if a total of 2.1 billion acres of farmland reduced fertilizer use by 2050, avoided N₂O emissions could equal 1.8 gigatonnes CO₂e (Drawdown, "Food: Nutrient Management" online: Drawdown <u>http://www.drawdown.org/solutions/food/nutrientmanagement</u> [Accessed November 10, 2017]).
- 61. See Government of Ontario, "About Ontario" (2017) online: <u>https://www.ontario.ca/page/about-ontario</u>. [Accessed November 10, 2017]
- Food and Agriculture Organization of the United Nations, "By the numbers: GHG emissions by livestock" (2017), online: FAO <u>http://www.fao.org/news/</u> <u>story/en/item/197623/icode/</u>. [Accessed November 10, 2017]
- Environment and Climate Change Canada, National Inventory Report 1990-2015: Greenhouse Gas Sources and Sinks in Canada, Part 1 (Ottawa: ECCC, 2017) at 70.
- California Air Resources Board, Short-Lived Climate Pollutant Reduction Strategy (March 2017) at 70, online: <u>https://www.arb.ca.gov/ cc/shortlived/meetings/03142017/final_slcp_report.pdf</u>. [Accessed November 10, 2017]
- Tallgrass Ontario, "Ontario Grassland Initiative" (2016) online: <u>http://</u> <u>www.tallgrassontario.org/ogi.html</u>. [Accessed Accessed November 10, 2017].
- Food and Agriculture Organization, "Grassland Carbon Sequestration: Management, Policy and Economics – Proceedings of the Workshop on the Role of Grassland Carbon Sequestration in the Mitigation of Climate Change" *Integrated Crop Management*, vol 11-2010 (Rome: FAO, 2010) online: <u>http://www.fao.org/docrep/013/i1880e/i1880e00.htm</u>. [Accessed Accessed November 10, 2017]
- 67. While oil seed and grain operations make up the largest portion of Ontario's agricultural operations, livestock farming still makes up a large part of the agricultural sector in the province. See Statistics Canada, "Cropland in Ontario grows despite fewer farms" (May 10, 2017) online: <u>https://www.statcan.gc.ca/pub/95-640-x/2016001/article/14805-eng.</u> <u>htm</u>. [Accessed November 10, 2017]
- TVO, "Climate Watch Shorts: The Ojibway Prairie Complex" at 1:20, online: TVO <u>http://tvo.org/video/programs/climate-watch-shorts/climate-watch-shorts-the-ojibway-prairie-complex</u>. [Accessed November 10, 2017]
- Ojibway Nature Centre, "Tallgrass Prairie in Southern Ontario" (2007) online: Ojibway Nature Centre <u>http://www.ojibway.ca/on_prair.htm</u>. [Accessed November 10, 2017]
- TVO, "Climate Watch Shorts: The Ojibway Prairie Complex" at 1:45, online: TVO <u>http://tvo.org/video/programs/climate-watch-shorts/climate-watch-shorts-the-ojibway-prairie-complex</u>. [Accessed November 10, 2017]
- Lorraine Johnson, "Endangered Ecosystem: Carolinian Zone" ON Nature Magazine (2009), online: <u>http://onnaturemagazine.com/endangeredecosystem-carolinian-zone.html</u>. [Accessed November 10, 2017]
- TVO, "Climate Watch Shorts: The Ojibway Prairie Complex" at 3:50, online: TVO <u>http://tvo.org/video/programs/climate-watch-shorts/climate-watch-shorts-the-ojibway-prairie-complex</u>. [Accessed November 10, 2017]



- 73. Ibid at 4:03.
- Environment and Climate Change Canada, National Inventory Report 1990-2015: Greenhouse Gas Sources and Sinks in Canada, Part 1 (Ottawa: ECCC, 2017) at 77.
- 75. For example, the City of Guelph reports that nearly 30% of the City's annual GHG emissions come from wastewater and sewage pumping facilities (City of Guelph, "Performance Management" (2017) online: City of Guelph <u>http://guelph.ca/living/environment/energy/measuring-performance/</u> [Accessed November 10, 2017]). For further discussion of wastewater emissions see Environmental Commissioner of Ontario, *Every Drop Counts: Reducing the Energy and Climate Footprint of Ontario's Water Use*, Annual Energy Conservation Progress Report 2017, vol 1 (Toronto: ECO, May, 2017).
- 76. Environment and Climate Change Canada, National Inventory Report 1990-2015: Greenhouse Gas Sources and Sinks in Canada, Part 1 (Ottawa: ECCC, 2017) at 70. It is worth noting, however, that Ontario's emissions from manure management decreased between 1990 and 2015, from 7.4 to 6.3 Mt CO₂e (National Inventory Report 1990-2015: Greenhouse Gas Sources and Sinks in Canada, Part 3 (Ottawa: ECCC, 2017) at 82).
- Environment and Climate Change Canada, National Inventory Report 1990-2015: Greenhouse Gas Sources and Sinks in Canada, Part 1 (Ottawa: ECCC, 2017) at 51.
- Bogner, J et al, "Waste Management" (2007) in *Climate Change 2007: Mitigation*. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [B Metz, O R Davidson, P R Bosch, R Dave, L A Meyer (eds)], (Cambridge: Cambridge University Press, 2007) at 587, online: <u>https://www.ipcc. ch/pdf/assessment-report/ar4/wg3/ar4-wg3-chapter10.pdf</u>. [Accessed November 10, 2017]
- Drawdown, "Food: Composting" online: Drawdown <u>http://www.drawdown.org/solutions/food/composting</u>. [Accessed November 10, 2017]
- California Air Resources Board, "Compliance Offset Program" online: <u>https://arb.ca.gov/cc/capandtrade/offsets/offsets.htm</u>. [Accessed September 27, 2017]
- 81. CM Anderson, CB Field, and KJ Mach, "Forest offsets partner climatechange mitigation with conservation" (2017) *Fron Ecol Environ* at 1.
- JM Metsaranta et al, "Uncertainty of inventory-based estimates of the carbon dynamics of Canada's managed forest (1990–2014)" (2017) 47 Can J For Res 1082, online: <u>http://www.nrcresearchpress.com/</u> <u>doi/pdf/10.1139/cjfr-2017-0088</u>. [Accessed October 5, 2017]; Valentin Bellassen and Sebastiaan Luyssaert, "Carbon sequestration: Managing forests in uncertain times" (2014) 506 Nature 153, online: <u>https://www. nature.com/news/carbon-sequestration-managing-forests-in-uncertaintimes-1.14687</u>. [Accessed October 5, 2017]
- Ontario Ministry of Natural Resources and Forestry, Ontario's Crown Forests: Opportunities to Enhance Carbon Storage? A Discussion Paper (November 22, 2016) at 15, online: <u>http://apps.mnr.gov.on.ca/public/</u> files/er/mnrf-16-244-discussion-paper.pdf. [Accessed October 5, 2017]
- UK Forestry Commission, "The EU Emissions Trading System: Opportunities for Forests?" online: <u>https://www.forestry.gov.uk/pdf/</u> <u>SERG EU_emmissions trading research summary.pdf/</u><u>FILE/SERG_EU_emmissions trading research_summary.pdf</u>. [Accessed November 9, 2017]

- 85. California Environmental Protection Agency, Air Resources Board, "Compliance Offset Protocol U.S. Forest Projects" (June 25, 2015) at 2.
- 86. For example, the California protocol claims that an improved forest management project is "a type of forest project involving management activities that increase carbon stocks on forested land relative to baseline levels of carbon stocks" (California Environmental Protection Agency, Air Resources Board, "Compliance Offset Protocol U.S. Forest Projects" (June 25, 2015) at 5).
- Climate Action Reserve, "Ontario and Quebec Forest & Reforestation/ Afforestation Offset Protocol Adaptation Stakeholder Meeting", online: Climate Action Reserve <u>http://www.climateactionreserve.org/</u> wp-content/uploads/2017/01/Forest-Afforestation-Stakeholder-Initial-Webinar.pdf. [Accessed November 15, 2017]
- Ministry of Natural Resources and Forestry, State of Ontario's Natural Resources – Forests 2016 (2016) at 6, online: <u>https://files.ontario.ca/</u> forests2016-final-accessible.pdf. [Accessed October 5, 2017]
- 89. Natural Resources Canada, The State of Canada's Forests: Annual Report 2016 (2016) at 7, online: <u>http://cfs.nrcan.gc.ca/pubwarehouse/pdfs/37265.pdf</u>. [Accessed October 5, 2017] Despite the current focus on the emerging role of wood products in climate change mitigation, there are a number of ways that increased reversal risk can be mitigated through other measures such as controlled burns, reducing fuel loads, and improving suppression capability and knowledge of fire behaviour.
- 90. See Appendix B for more information about buffer accounts.
- Product life cycle emissions should be excluded from the forest offset protocol for those emissions that are covered by a carbon cap (inclusion would result in double-counting). However, those emissions taking place outside of the capped jurisdictions should be taken into account as leakage.
- California uses a default 20% leakage factor applied to the difference in harvest volume relative to baseline, whereas British Columbia's factor is closer to 50% (MOECC, Response to Information Request, July 4, 2017).
- California Environmental Protection Agency, Air Resources Board, "Compliance Offset Protocol U.S. Forest Projects" (June 25, 2015) at 32.
- 94. The protocol does not award credits to forest projects that increase harvesting in the project location and reduce harvesting outside the project boundary (California Environmental Protection Agency, Air Resources Board, "Compliance Offset Protocol U.S. Forest Projects" (June 25, 2015) at 42 and 47). Without further explanation of the rationale for this choice, it is difficult to test the veracity of reductions claimed under California's forest offset protocol.
- 95. It is worth noting that, in the California forest offset protocol, the risk of over-crediting due to leakage-related uncertainty would disappear for projects that involve an increase in forest carbon storage per acre, and increased timber harvesting above the baseline, since positive leakage is not credited. This can potentially happen with sustainably managed longer rotations (older forests) depending on species and age. Even in these cases, there is also a lot of uncertainty in project baselines and additionality, despite a moderated leakage risk. So far under California's U.S. Forest Projects offset protocol, almost all compliance offset projects involve reductions in timber harvesting (Barbara Haya, pers comms, November 2017).

- Intergovernmental Panel on Climate Change (IPCC), IPCC Fourth Assessment Report, Climate Change 2007: Working Group III: Mitigation of Climate Change, 9.6.6.1 Leakage (Geneva, Switzerland: IPCC 2007) https://www.ipcc.ch/publications_and_data/ar4/wg3/en/ch9s9-6-6-1. html. [Accessed 22 November 2017]
- Intergovernmental Panel on Climate Change (IPCC), IPCC Fourth Assessment Report, Climate Change 2007: Working Group III: Mitigation of Climate Change, 9.6.6.1 Leakage (Geneva, Switzerland: IPCC 2007) https://www.ipcc.ch/publications_and_data/ar4/wg3/en/ch9s9-6-6-1. html. [Accessed 22 November 2017]
- The model referred to is used by the U.S. EPA. See Darius Adams et al, FASOMGHG Conceptual Structure, and Specification: Documentation (2005) at 117, online: <u>http://agecon2.tamu.edu/people/faculty/mccarlbruce/papers/1212FASOMGHG_doc.pdf</u>. [Accessed December 11, 2017]
- 99. This leakage was associated with the reduction of timber supplies.
- 100. Intergovernmental Panel on Climate Change (IPCC), IPCC Fourth Assessment Report, Climate Change 2007: Working Group III: Mitigation of Climate Change, 9.6.6.1 Leakage (Geneva, Switzerland: IPCC 2007) https://www.ipcc.ch/publications_and_data/ar4/wg3/en/ch9s9-6-6-1. html. [Accessed 22 November 2017], citing D Wear & B Murray, "Federal timber restrictions, interregional spillovers, and the impact on US softwood markets" (2004) 47 Journal of Environmental Economics and Management 2 at 307-330.
- 101. The Ontario Ministry of Natural Resources and Forestry published a detailed report in 2013 on carbon flows from harvested wood products (HWPs) in Ontario (J Chen, SJ Colombo, and MT Ter-Mikaelian, Carbon Stocks and Flows from Harvest to Disposal in Harvested Wood Products from Ontario and Canada (Sault Ste Marie: Ontario Ministry of Natural Resources, 2013) [J Chen, Carbon Stocks and Flows]). A close inspection of its modelling assumptions reveals the extent of the uncertainty of its estimated emissions from HWPs in Ontario at end-of-life. For example, the modelled results in the MNRF's study adopted U.S.-based assumptions on the HWP fractions which eventually decompose in landfills and the half-life of HWPs in landfills and open dumps. The original source for these figures - Freed and Mintz 2003, as cited in Skog 2008, is a memorandum which is unavailable online (J Chen, Carbon Stocks and Flows at 28). The uncertainty of these assumptions was noted in the report - e.g., the report noted the difference between the default IPCC (2006) assumption for the proportion of HWP carbon subject to decomposition in managed landfills (0.5) and those of the FAO (2011), which assumes a proportion of 0.2 for solid HWP carbon and 0.5 for paper and paper products (Ibid at 27). The MNRF's report also noted the uncertainty associated with the assumed rate of methane oxidation in landfills (Ibid at 28), which would considerably affect the GHG benefit of the HWP carbon sink.
- 102. California's forest offset protocol excludes expected landfill methane emissions from its avoided conversion project GHG estimates (equivalent to assuming a 100% methane capture rate throughout the required 100-year wood product carbon storage period).
- 103. California Environmental Protection Agency, Air Resources Board, "Compliance Offset Protocol U.S. Forest Projects" (June 25, 2015) at 46 and 54. Emissions associated with fossil fuel use during site preparation are included in reforestation projects (*Ibid* at 54), but not avoided conversion (*Ibid* at 44) and improved forest management ones (*Ibid* at 41).

- 104. J Chen et al, "Carbon Profile of the Managed Forest Sector in Canada in the 20th Century: Sink or Source?" (2014) 48 *Environ Sci Technol*, 9859 at 9863; B Upton et al, *The greenhouse gas and carbon profile of the Canadian forest products industry* (Special Report No 07-09) (Research Triangle Park, NC: National Council for Air and Stream Improvement, Inc, 2007) at 21.
- 105. J McKechnie et al, Energy Use and Greenhouse Gas Inventory Model for Harvested Wood Product Manufacture in Ontario (Sault Ste Marie: Science and Research Branch, Ontario Forest Research Institute, Ministry of Natural Resources, 2014) at 8.
- 106. For reforestation projects, California's forest offset protocol accounts for emissions from fossil fuel use during site preparation (California Environmental Protection Agency, Air Resources Board, "Compliance Offset Protocol U.S. Forest Projects" (June 25, 2015) at 38). This erroneous accounting decision results in double-counting, as these fossil fuels are covered under the cap.
- 107. C Whittaker et al, "Dry Matter Losses and Methane Emissions During Wood Chip Storage: The Impact on Full Life Cycle Greenhouse Gas Savings of Short Rotation Coppice Willow for Heat" (2016) 9 Bioenerg Res 820 at 820; C Whittaker et al, "Dry Matter Losses and Greenhouse Gas Emissions from Outside Storage of Short Rotation Coppice Willow Chip" (2016) 9 Bioenerg Res 288 at 301. GHG emissions from wood chip storage is a relevant issue even for offset projects which focus on the production of long-lived forest products. In promoting the increased production of long-lived forest products, it should be remembered that only a portion of a harvested saw-log becomes lumber, with the rest often used as fuel and products with shorter service lives such as paper. A recent study of an Ontario sawmill in the Great Lakes-St. Lawrence forest region indicated that only 23%-30% of the volume of a saw-log became lumber (converted to a long-lived product), with the remaining residue composed of chips, bark and sawdust. See M Cockwell and J Caspersen, "Sources of Variation in the Net Value of Sugar Maple Trees: Implications for Tree Selection and Operations Management" (2014) 64 Forest Products Journal 250.
- 108. Soot, although not a GHG, is an airborne particle that contributes to the short-term warming of the climate. For example, soot that settles on snow will decrease its reflectivity and accelerate its melting.
- California Environmental Protection Agency, Air Resources Board, "Compliance Offset Protocol U.S. Forest Projects" (June 25, 2015) at 37, 40-41, and 43-44.
- Ontario Ministry of Natural Resources and Forestry, Ontario's Crown Forests: Opportunities to Enhance Carbon Storage? A Discussion Paper (November 22, 2016) at 8, online: <u>http://apps.mnr.gov.on.ca/public/files/</u> er/mnrf-16-244-discussion-paper.pdf. [Accessed October 5, 2017]
- 111. DA Etheridge and GJ Kayahara, "Challenges and implications of incorporating multi-cohort management in northeastern Ontario, Canada: A case study" (2013) 89 *The Forestry Chronicle* 315 at 321-322: "Finally, current wood supply models used in boreal Ontario do not consider forms of partial harvesting that result in uneven-aged stand conditions (e.g., irregular shelterwood, selection system). Partial harvesting in uneven-aged stand conditions is not explicitly incorporated into current boreal wood supply modeling in Ontario."

- 112. Ontario Ministry of Natural Resources and Forestry, *Ontario's Crown* Forests: Opportunities to Enhance Carbon Storage? A Discussion Paper (November 22, 2016) at 8, online: http://apps.mnr.gov.on.ca/public/files/ er/mnrf-16-244-discussion-paper.pdf. [Accessed October 5, 2017]
- 113. DA Etheridge and GJ Kayahara, "Challenges and implications of incorporating multi-cohort management in northeastern Ontario, Canada: A case study" (2013) 89 The Forestry Chronicle 315 at 316.
- 114. DA Etheridge and GJ Kayahara, "Challenges and implications of incorporating multi-cohort management in northeastern Ontario, Canada: A case study" (2013) 89 *The Forestry Chronicle* 315 at 316.
- 115. One Ontario-based study suggests that forest management projects that include a harvest component may result in greater GHG mitigation than a "no management" conservation project (SJ Colombo et al, "Forest protection and forest harvest as strategies for ecological sustainability and climate change mitigation" (2012) 281 *Forest Ecology and Management* 140 at 148). However, that same study makes clear that carbon storage in a "no harvest" scenario (with management that suppresses natural disturbance) considerably exceeds the storage in the harvest scenario alternatives for almost 100 years. This tells us that the time horizon used to evaluate net carbon sequestration has a big effect on the results.
- 116. Intact does not necessarily mean unchanging for example, it is important for our forest management policies to facilitate tree species migration so that Ontario's forests can better adapt to the changing climate.
- 117. Food and Agriculture Organization of the United Nations, "Benefits of Urban Trees" FAO, online: FAO <u>http://www.fao.org/resources/</u> infographics/infographics-details/en/c/411348/. [Accessed November 10, 2017].

Chapter 5 Spending From the Greenhouse Gas Reduction Account

Abstract

How is the provincial government using the billions of dollars that are flowing into the Greenhouse Gas Reduction Account (GGRA) from cap and trade auctions?

According to the *Climate Change Mitigation and Low-carbon Economy Act, 2016* (*"Climate Act"*), GGRA funds must be used to reduce, or support the reduction of, greenhouse gas emissions. Most initiatives funded to date are intended to reduce emissions from fossil fuel use, i.e., emissions that are already covered by the cap on allowances. Such initiatives can support reductions by reducing the cost of complying with the cap for some sectors of the economy, but are not likely to reduce Ontario's overall emissions beyond those achieved by the cap. Some initiatives, such as energy efficiency upgrades to reduce fossil fuel consumption in hospitals, schools and low-income housing, have a high potential for also producing social and economic benefits.

Spending From the Greenhouse Gas Reduction Account

How well is the government using the money from cap and trade?

Good start, but should do better

Government understanding and management of GGRA initiatives was modest at first, but is starting to improve. By next year, the ECO expects to see a coherent plan for tying GGRA funding decisions to the emissions-reduction targets in the *Climate Act* and to the reduction responsibilities of each ministry.

Ontario's next emissions milestone is 2020, right around the corner, but it will take time to reshape the energy foundation of Ontario's economy. It will also take much more than the relatively small amount of GGRA funding, which is dwarfed by the impacts of broader government economic and regulatory policy. For now, the GGRA's most important benefit is the change it has triggered, both within and outside government, in understanding Ontario's emissions and the opportunities to reduce them.

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Section 71 of the *Climate Change Mitigation and Low-carbon Economy Act, 2016* (the "*Climate Act*") requires the government to place all proceeds from its emission allowance auctions into a Greenhouse Gas Reduction Account (GGRA), a notional account within the Consolidated Revenue Fund.

5.0.1 How GGRA Funds Must Be Spent

The *Climate Act* permits GGRA funds to be used only for initiatives that are "**reasonably likely to reduce**, **or support the reduction of, greenhouse gas emissions**" and certain related administrative costs.

The ECO has observed some public scepticism and concern about how the government will use the large amount of new money that the cap and trade system has begun to raise.

In our 2016 Greenhouse Gas Progress Report, *Facing Climate Change*, we emphasized the need for transparency and accountability on how the government uses these funds.¹ We recommended that evaluation criteria be established to make clear how and why funds are allocated. As well, we emphasized that any emissions reductions attributed to GGRA spending must be *additional* to those produced through existing programs.

Now that cap and trade proceeds are flowing in, the ECO has begun to review how the government is allocating the money.

NOW THAT CAP AND TRADE PROCEEDS ARE FLOWING IN, THE ECO HAS BEGUN TO REVIEW HOW THE GOVERNMENT IS ALLOCATING THE MONEY

Documentation and Transparency

In Facing Climate Change, the ECO proposed that: detailed records of the analysis that justifies each GGRA expenditure... should be included in a separate appendix which can be readily severed from any confidential Cabinet documents, so that officers of the Legislature can effectively review their sufficiency, prudence and completeness.²

The government agreed to provide the ECO with access to documents on GGRA expenditures, by way of an Order in Council (contained in Appendix C, which is available online only at eco.on.ca). The ECO then began the process of seeking the necessary information from ministries and received the first tranche of documentation late in our report preparation process. We plan to do a more thorough analysis in future years.

5.1 The GGRA Funding Process to Date

5.1.1 2015 Down Payment: The Green Investment Fund

In late 2015, the province announced what it called a \$325 million *down payment* on climate action named the Green Investment Fund (GIF). Funds for the nine projects were all transferred to third party organizations, mostly to be spent over several years (see Section 5.2.1).

When these GIF initiatives were announced, the *Climate Act* had not yet passed, the *Climate Change Action Plan* (CCAP) was just being developed, the cap and trade program had not started, and our report *Facing Climate Change* had not been released.

At the time, the province was still proposing to use GGRA proceeds to subsidize electricity rates, a proposal that it subsequently and properly abandoned (see Section 5.5.1). In other words, government understanding of the proper uses of the GGRA was incomplete. As well, the government had no clear methodology for quantifying greenhouse gas (GHG) reductions from GGRA initiatives, and no overall plan for selecting the best projects.

All ministries involved had a very steep learning curve, and the Ministry of the Environment and Climate Change (MOECC) had limited in-house staff to assist. Projects were selected through an informal process that focused on finding partners with existing energy-related projects that could quickly receive funds.

Because the GGRA did not yet exist, the funding for GIF projects came from general revenues with the expectation that the province would reimburse itself from the GGRA once auction proceeds were received. Our review of the GIF initiatives is in Section 5.2.1.

IN 2017, THE MOECC DEVELOPED A MORE FORMAL PROCESS FOR ALLOCATING GGRA FUNDS



5.1.2 A More Formal Process in 2017

In early 2017, the MOECC developed a more formal process for allocating GGRA funds, including an internal GGRA evaluation framework. The structure and governance of the GGRA is built on the government-wide annual Program Review, Renewal and Transformation budget processes that the province uses for its overall fiscal decision making.

Individual ministries seeking GGRA monies put forward projects that have been evaluated by an inter-ministerial committee, with help from external experts. The committee makes quantitative and qualitative recommendations to the Minister of the Environment and Climate Change. Each proposed initiative is documented on a scorecard with evaluation criteria and an intake form, intended to show whether the initiative will:

- Produce GHG reductions;
- Align with the Climate Change Action Plan;
- Reduce Ontario emissions from its annual baseline; and
- Support Ontario's transition to a low-carbon economy.

The Minister of the Environment and Climate Change in turn performs a review and evaluation for Cabinet of each individual initiative, as required by section 71(3) of the *Climate Act*. Before the government spends GGRA money on an initiative, the Minister must evaluate it. In addition to each initiative's potential GHG reductions, the Minister must consider:

- Its relationship to achieving Ontario's GHG-reduction targets;³
- Its relationship to other GHG-reduction initiatives;
- Its relationship to the Climate Change Action Plan; and
- Whether it is also likely to assist low-income households and vulnerable communities with their transition to a low-carbon economy.

The Minister may also consider other matters that he/she considers appropriate. Following the Minister's review, the MOECC puts together an Annual Greenhouse Gas Investment Plan for Cabinet, which provides an evaluation of all proposed GHGreduction initiatives.

5.1.3 A Methodology to Predict Emission Reductions

A credible evaluation of GGRA initiatives must be based on a coherent method to estimate the GHG reductions that can fairly be expected from an initiative, including methods for data collection and analysis.

By June 2017, the MOECC developed a guidance document, the Ontario Public Service Guidance Document for Quantifying Projected and Actual Greenhouse Gas Emission Reductions. The document is to help ministries estimate GHG reductions for GGRA projects. The ECO made substantive comments on a draft of this guidance document, particularly on baselines, evaluation criteria for research, and trade-offs between accuracy and simplicity. The final guidance document addressed some of our concerns and the ECO expects the document to be used consistently moving forward.

Our review of 2017 GGRA initiatives is in Section 5.2.2.

THE GOVERNMENT HAS ALLOCATED \$1.37 BILLION OF GGRA FUNDS



5.2 How Have the GGRA Funds Been Allocated So Far?

As described in Chapter 2, Ontario's first four carbon auctions occurred in March, June, September and November of 2017; subsequent auctions (as part of the Western Climate Initiative) will occur quarterly. All proceeds from the 2017 auctions, a total of \$1.9 billion, were received in the province's 2017/2018 fiscal year. As of November 2017, the government had announced 18 approved GGRA initiatives at a cost of \$1.05 billion (two additional initiatives with funding of \$17 million have been approved but not yet publicly announced). When added to the \$319 million⁴ spent through the GIF in 2016, the government has allocated \$1.37 billion of GGRA funds to GHG-reduction initiatives.

Allocated vs. Spent – A Note on Terminology

Throughout this chapter, we discuss what has been *allocated* from the GGRA, not what has been *spent*. While funds have been allocated to many initiatives, and many transfer payment agreements signed, the ECO has no evidence that any money has been actually transferred out of the GGRA. The ECO understands that ministry recipients must spend from their general budgets and then request reimbursement from the GGRA. As of November 2017, we had no evidence that any ministry had yet requested a reimbursement.



Figure 5.1. Summary of Ontario 2017 cap and trade proceeds and allocations to the GIF and GGRA (as of November 2017).

Source: Ministry of the Environment and Climate Change, Annual Greenhouse Gas Investment Plan (2017); Government of Ontario press releases.

Therefore, of the \$1.9 billion raised by cap and trade in 2017, approximately 71% has been allocated to various initiatives.⁵ This leaves \$551 million (29% of the 2017 cap and trade revenues) that has not yet been allocated (Figure 5.1), minus an undisclosed amount to support the program's administrative costs.

The allocations from the GGRA and GIF break down by sector as follows (Figure 5.2):

- Homes and Businesses
 \$968.0 million
- Government and Partnerships
 \$110.1 million
- Transit and Active Transportation
 \$103.5 million
- Research and Development
 \$99.8 million
- Electric Vehicles
 \$90.40 million
- Agriculture, Land and Forests
 \$1.1 million

Spending From the Greenhouse Gas Reduction Account





5.2.1 2015/2016 Green Investment Fund Initiatives

In November 2015, the province announced its intention to establish a *Green Investment Fund* with a *down payment* of \$325 million with the goal of "reducing GHG emissions while strengthening the economy."⁶ Although the GIF pre-dated the CCAP, it was intended to align with its eventual goals and action areas. The following nine initiatives were approved in January 2016 and announced shortly afterwards. Ministries funded these initiatives from their own budgets and the government plans to reimburse them with GGRA funds.

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Table 5.1. Green Investment Fund Initiatives (Listed in order of amount).

5

Ministry	Initiative	Detail	Funding
Ministry of Energy	Home Energy Audits and Energy Efficiency Retrofit Program	Energy conservation initiatives for 37,000 additional homes, delivered by Union Gas and Enbridge	\$100 million
Ministry of Housing	Social Housing Apartment Retrofit Program	Energy efficiency retrofits in social housing high-rise buildings	\$82 million
Ministry of Economic Development and Growth	TargetGHG	Clean tech research and development and demonstration projects for large industrial emitters	\$74 million
Ministry of Economic Development and Growth	SMART Green	Grants for equipment upgrades for small/ medium manufacturers that are not part of the cap and trade program	\$25 million
Ministry of Transportation	Electric Vehicle Chargers Ontario	Public charging network for electric vehicles	\$20 million
Ministry of Housing	Social Housing Electricity Efficiency Program	Electrical energy savings for low-density social housing units	\$10 million
Ministry of Energy	Smart Grid Fund	Renewable energy micro-grid systems in two remote First Nations communities to reduce the use of diesel	\$4 million ⁷
Ministry of Indigenous Relations and Reconciliation	Support for Indigenous Communities	Building First Nations' technical capacity for climate change mitigation	\$3 million ⁸
Ministry of the Environment and Climate Change	Sustainability CoLab	Funding to help small businesses reduce emissions	\$1 million
Total			\$319 million

Source: Ministry of the Environment and Climate Change, Annual Greenhouse Gas Investment Plan (2017); Government of Ontario press releases.

5

5.2.2 2017/2018 Greenhouse Gas Reduction Account Initiatives

By 2017, the government had finalized its Climate Change Strategy and Action Plan, passed the *Climate Act*, and the cap and trade program was up and running. The 18 initiatives announced as of November 2017 total \$1.05 billion, and cover several important themes identified in the CCAP:

- Reducing emissions from key sectors (e.g., homes, businesses, industry, transportation, government, agriculture and forestry);
- Supporting alternative technologies and transportation modes (e.g., electric vehicles, active transportation);
- Funding clean tech research and development; and
- Partnering with Indigenous communities, municipalities and other key stakeholders.

Ministry	Initiative	Detail	Funding
Ministry of the Environment and Climate Change	Green Ontario Fund ('GreenON')	Funding to create entity responsible for enhancing the uptake of low-carbon technologies in new and existing buildings	\$377 million
Ministry of Education	School Retrofit Program	Funding to retrofit buildings across 72 school boards	\$200 million
Ministry of the Environment and Climate Change	Municipal GHG Challenge Fund	Funding to support emissions-reductions projects for municipalities that have community energy plans/climate action plans	\$100 million
Ministry of Transportation	Ontario Municipal Commuter Cycling Program	Funding to enhance commuter cycling corridors	\$93 million
Ministry of Housing	Social Housing Apartment Improvement Program	Funding to extend program that was previously supported by Green Investment Fund	\$85 million
Ministry of Health and Long-Term Care	Hospital Energy Efficiency Program	Funding for 180 energy efficiency projects, mainly focused on heating, ventilation and air conditioning systems, waste anaesthetic gases, and lighting	\$64 million
Ministry of Transportation	Electric Vehicle Purchase Incentive Program	Funding for revised program to support adoption of electric vehicles	\$47 million

Table 5.2. Fiscal Year 2017/2018 GGRA Initiatives - Announced to November 2017 (Listed in order of amount).

Table continues on next page.

Ministry	Initiative	Detail	Funding
Ministry of Research, Innovation and Science	Low-Carbon Innovation Fund	Funding to provide support for clean technology innovation	\$25.8 million
Ministry of Advanced Education and Skills Development	Low-Carbon Building Skills	Funding to increase capacity of unions and colleges to train workers in low-carbon building skills	\$24 million
Ministry of Transportation	Electric Vehicle Chargers Ontario	Funding to extend program that was previously supported by Green Investment Fund	\$20 million
Ministry of Transportation	Electric School Bus Pilot Program	Funding for tests in five communities across Ontario	\$8 million
Ministry of the Environment and Climate Change	Climate Change Partnerships	Funding for external organizations to support behavioural change	\$3.05 million
Ministry of Transportation	Commuter Bike Parking Program	Funding for bicycle parking at key commuter locations	\$2.5 million
Ministry of Transportation	Electric Vehicle Charging Infrastructure	Funding to implement electric vehicle charging infrastructure at GO Transit rail stations and other government facilities	\$2.27 million
Ministry of Transportation	Electric Vehicle Discovery Centre	Funding for facility that educates consumers about electric vehicles	\$1 million
Ministry of Natural Resources and Forestry	Land Use Carbon Inventory	Funding to develop an inventory to quantify and assess emissions and sequestration from agriculture, forestry and other land uses	\$0.75 million
Ministry of Natural Resources and Forestry	50 Million Trees	Funding to increase tree planting target in urban areas from 1 million to 2 million	\$0.38 million
Ministry of the Environment and Climate Change	Electric and Hydrogen Vehicle Advancement Partnership	Funding for research and development into electric and hydrogen vehicle technologies	\$0.09 million
TOTAL			\$1.05 billion

Source: Ministry of the Environment and Climate Change, Annual Greenhouse Gas Investment Plan (2017); Government of Ontario press releases.

Spending From the Greenhouse Gas Reduction Account



Figure 5.3. Total GIF and GGRA allocations by government ministry (as of November 2017).

Source: Ministry of the Environment and Climate Change, Annual Greenhouse Gas Investment Plan (2017); Government of Ontario press releases.

DO PROJECTS THAT REDUCE FOSSIL FUEL USE BY AN INDIVIDUAL OR BUSINESS REDUCE ONTARIO'S TOTAL CAPPED GHG EMISSIONS?

THE ANSWER IS USUALLY NO



5.3 Do These Initiatives Reduce Ontario's Total Capped GHGs?

The government frequently claims that its GGRA initiatives "reduce greenhouse gas emissions."⁹ To date, most GGRA funds have been used for projects to reduce fossil fuel consumption in Ontario, such as electric vehicle incentives and building efficiency improvements. This raises an important and poorly understood question. Since the cap on GHG allowances covers essentially all fossil fuel use in Ontario,¹⁰

Do projects that reduce fossil fuel use by an individual or business reduce Ontario's GHG emissions?

The answer is usually *no*. A project that reduces fossil fuel use by an individual or business reduces the emissions of that particular individual or business. However, the project is not likely to reduce Ontario's GHG emissions as a whole.

Why? The purpose of a legal cap is to keep Ontario's emissions lower than they would otherwise be. *If the cap has that effect*, the GHG emissions covered by the cap will be limited by, and therefore equal to, the supply of allowances (i.e., the number of allowances issued by the government).¹¹

Supply of allowances = GHGs emitted by capped sectors, mostly from fossil fuels¹²

No GGRA initiative can change the supply of allowances, which is set by section 54 of O. Reg. 144/16, made under the *Climate Act*.

GGRA initiatives to reduce fossil fuel use can only reduce the demand for allowances by some individuals and organizations. This should lower the price of allowances at auction and/or in the secondary market, and may make more allowances available for other emitters to purchase. But as long as Ontario's capped emissions equal (i.e., use up) the supply of allowances, reducing some of the demand for allowances through GGRA initiatives will not reduce total GHGs (Figure 5.4).¹³



Figure 5.4. Results of GGRA spending on Ontario's total emissions. Without a cap (left), there is no price on carbon and no emissions reductions. With a binding cap *but no* GGRA funding (middle), each of the three sources of emissions must purchase allowances or reduce GHG emissions to meet the cap. With a binding cap *and* GGRA funding for Source 1 to reduce its fossil fuel use (right), Source 1 will require fewer allowances. This reduces demand, and the price, for allowances. Sources 2 and 3 may choose to buy these cheaper allowances, instead of reducing their emissions. As a result, overall emissions may remain the same.¹⁴

Such GGRA initiatives still meet the minimum requirements of the *Climate Act*, because they support the emissions reductions that the cap requires, by making those emissions reductions cheaper, easier and politically more acceptable.¹⁵ GGRA initiatives can also reduce energy costs for particular individuals, organizations or sectors, which may have valuable social, economic and/or environmental effects.

If the government wants GGRA funds to produce additional emissions reductions, beyond those required by the cap on the supply of allowances, it should fund initiatives to reduce the 18% of Ontario emissions that are not covered by the cap: non-fossil fuel emissions, primarily methane and nitrous oxide, from agriculture and waste. Anaesthetics are another source of uncapped emissions that could also be a promising target – see Appendix D (which is available online only at eco.on.ca).

Could warmer winters, GGRA initiatives, federal Clean Fuel regulations and other measures drive the demand for allowances down so far that total emissions no longer equal the supply of allowances? (If so, the price of allowances would likely be at the floor and an allowance auction may not sell out.) This is certainly possible; see Chapter 3. If and when Ontario's cap is too loose to limit GHG emissions, then GGRA initiatives to reduce fossil fuel use could achieve net GHG reductions.

IF THE GOVERNMENT WANTS GGRA FUNDS TO PRODUCE ADDITIONAL EMISSIONS REDUCTIONS, IT SHOULD FUND INITIATIVES TO REDUCE THE 18% OF ONTARIO EMISSIONS THAT ARE NOT COVERED BY THE CAP

5.4 Plan vs. Action: Which Parts of the Climate Change Action Plan Have Been Funded?

A five-year *Climate Change Action Plan* (CCAP), released in June 2016, includes numerous initiatives the government intended to fund from the GGRA.¹⁶ Which parts have been funded?

5.4.1 Funding of *Climate Change Action Plan* Initiatives

The CCAP presents funding estimates over the timeframe of the plan, rather than on an annual basis. The only indication of how much is to be spent each year comes from the provincial budget. In 2017/2018, the government forecast that cap and trade would bring in \$1.8 billion, which it would allocate among seven areas (Table 5.3). After four out of the five 2017/2018 auctions, total cap and trade proceeds were \$1.9 billion, slightly higher than forecast. The final auction of the fiscal year will take place in February 2018 (this is also the first auction for which Ontario will be part of the Western Climate Initiative). As of November 2017, the province had allocated \$1.37 billion of GGRA funds, including the \$319 million of the GIF.

Table 5.3. Proposed Annual Allocation and Actual GGRA Allocations in 2017/2018 Fiscal Year.

CCAP Investment Area	Proposed Annual GGRA Allocation (in millions)	2017/2018 GGRA Allocation (in millions)
Homes and Businesses	\$800	\$750
Electric Vehicles	\$90	\$70.4
Government and Partnerships	\$55	\$103.1
Transit and Active Transportation	\$420	\$103.5
Research and Development	\$20	\$25.8
Agriculture, Land and Forests	\$5	\$1.1
Other *	\$410	\$319
	\$1,800	\$1,373

* includes Green Investment Fund and "related spending to reduce GHG emissions," likely including government administrative costs

Source: Ontario Ministry of Finance, 2017 Ontario Budget: A Stronger, Healthier Ontario (2017); Ministry of the Environment and Climate Change, Annual Greenhouse Gas Investment Plan (2017); Government of Ontario press releases. 2017/2018 Allocation shown is to November 2017.

These allocations are roughly in line with the plan laid out in the budget, but with some variances (Figure 5.5). For example, the province allocated 56% of its GGRA funds towards homes and businesses, compared to a planned allocation of 45%. This reflects big ticket items such as the Green Ontario Fund or 'GreenON' (\$377 million in 2017/2018), school retrofits (\$200 million) and social housing programs (\$85 million). By contrast, just 8% of GGRA funds have been allocated to transit and active transportation (\$103.5 million), significantly lower than the proposed 23% of spending. The CCAP includes 47 action items requiring GGRA funding. In addition to the announced initiatives, 18 others had a start date in 2017 but had not received GGRA funding by November 2017 (Table 5.4). Ten other unfunded items are slated to start in future years.

THE CCAP INCLUDES 47 ACTION ITEMS REQUIRING GGRA FUNDING. IN ADDITION TO THE ANNOUNCED INITIATIVES, 18 OTHERS HAD A START DATE IN 2017 BUT HAD NOT RECEIVED GGRA FUNDING BY NOVEMBER 2017



Figure 5.5. Proposed allocations to GGRA, as per 2017/2018 Ontario budget (left), and actual GGRA allocations as of November 2017, as tracked by the ECO (right).

Source: Ontario Ministry of Finance, 2017 Ontario Budget: A Stronger, Healthier Ontario (2017); Ministry of the Environment and Climate Change, Annual Greenhouse Gas Investment Plan (2017); Government of Ontario press releases.

Action Area	Action Plan Item	Start Date	Intended GGRA Funding (in millions)	Comment
Transportation	Pilot Methane from Food Waste and Agriculture as a Fuel Source	2017	\$15-20	Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) released a Discussion Paper in May 2017 for a Proposed Agrifood Renewable Natural Gas for Transportation Demonstration Program
	Free Overnight Electric Vehicle Charging	2016-17	\$15	Four-year program for residential and multi-unit residential customers
	Improve Competitiveness of Short-Line Railways	2017	\$15-20	No update since CCAP
	Accelerate Regional Express Rail (RER) Deployment	Ongoing	\$355-675	In June 2017 Ontario announced it was committing \$13.5 billion to implement RER, as part of a \$21.3 billion investment in the GO Train network. This includes \$1.9 billion in federal infrastructure funding
	EV Partner and Dealership Program	2017	\$10-20	No update since CCAP

Table 5.4. Key CCAP Items for 2017 That Have Not Received GGRA Funding, as of November 2017.

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Action Area	Action Plan Item	Start Date	Intended GGRA Funding (in millions)	Comment
Buildings and Homes	Incentives for Apartment Building Retrofits	2017	\$300-400	These incentives will likely be provided by the Green Ontario Fund ('GreenON')
	Showcase Low- Carbon Technologies in Heritage Properties	2017	\$40-80	No update since CCAP
	Keep Electricity Rates Affordable	2017	\$1,000-1,320	In 2016, the ECO reported that "subsidizing electricity rates should not be considered an acceptable use of GGRA funds." The Ministry of Energy responded that "the decision regarding the final approach for [cap and trade] proceeds recycling has not been determined," and the action item "reflects a preliminary approach at the time of the release of the CCAP." ¹⁷ Since then, the MOECC has confirmed to the ECO that no GGRA funding was committed to this initiative.
	Establish Low- Carbon Content for Natural Gas	2017	\$60-100	No update since CCAP
Land-use Planning	Support Community Energy Plans for municipalities and First Nation communities	2017	\$20-25	No update since CCAP

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Action Area	Action Plan Item	Start Date	Intended GGRA Funding (in millions)	Comment
Industry and Business	Reduce Agri-Food Emissions and Retrofit Agricultural Facilities	2017	\$50-115	No update since CCAP
Research and Development	Global Centre for Low-Carbon Mobility	2017	\$100-140	No update since CCAP
	Showcase Ontario's Clean Tech Expertise	2017	\$75	No update since CCAP
Government	Ontario Public Service (OPS) Carbon Challenge	2017	\$0.25-1	No update since CCAP
	Climate change training for OPS employees	2017	\$0.25-1	OPS Guidance Document for Quantifying Projected and Actual GHG Emissions Reductions published in June 2017 to assist OPS employees in preparing climate change programs
Agriculture, Forests and Lands	Implement Waste- Free Ontario Strategy	2017	\$20-30	MOECC launched the <i>Waste-Free</i> Ontario Strategy in March 2017
	Long-Term Soil Health and Conservation Strategy	2017	\$30	OMAFRA released a draft <i>Soil Health</i> <i>and Conservation Strategy</i> for comment in November 2017. The final strategy is expected in Spring 2018
	Wetlands Conservation Strategy	Ongoing	\$0.5-1	Strategy finalized and released on July 20, 2017, along with \$1.9 million for wetland restoration. The ECO has not received any indication these funds are from the GGRA

THE PRIMARY GOAL OF THE ECO'S ANALYSIS THIS YEAR IS TO CONFIRM THAT GGRA FUNDS ARE BEING USED IN ACCORDANCE WITH THE *CLIMATE ACT*

5.5.1 Green Investment Fund: Two Doubtful Projects

It is the ECO's opinion that there were two uses of the Green Investment Fund that did not follow the requirements of the *Climate Act*: first, to support climate change adaptation, rather than mitigation; and second, to reduce electricity consumption, without satisfactory evidence that this would reduce Ontario's GHG emissions.

5.5 Step 1: Do GGRA Initiatives Meet the Minimum Test?

The primary goal of the ECO's analysis this year is to confirm that GGRA funds are being used in accordance with the *Climate Act*. The *Climate Act* sets only minimal criteria for permitted uses of the GGRA funds (and none for prioritizing among initiatives).¹⁸ The minimum requirement is that the expenditure must be,

... reasonably likely to reduce, or support the reduction of, greenhouse gas emissions.

As a first step, the ECO therefore asked: has the province shown that each GIF/GGRA expenditure is reasonably likely to reduce GHG emissions or *support* the reduction of such emissions? In our view, most of the initiatives passed this minimal screen, i.e., should support GHG reductions by reducing the cost of complying with the cap for some sectors of the economy. However, some uses of the cap and trade revenues did not meet even this minimum requirement. *Mitigation* focuses on reducing the extent of climate change by reducing GHG emissions. *Adaptation* focuses on reducing the harm caused by the effects of climate change. Adaptation is necessary and important, but the *Climate Act* requires that all GGRA funds be spent on mitigation.

TWO USES OF THE GREEN INVESTMENT FUND DID NOT FOLLOW THE REQUIREMENTS OF THE CLIMATE ACT
In 2016, the Ministry of Indigenous Relations and Reconciliation (MIRR) gave \$5 million of GIF funds to help First Nations communities build technical capacity for climate change adaptation and mitigation. The government announced that this \$5 million would be reimbursed from the GGRA. The government subsequently recognized that at least some elements of this initiative did not meet the legislative requirements for GGRA funding, as they focused on adaptation and not mitigation. The government eventually announced that only \$3 million (60%) of the \$5 million grant would be reimbursed from the GGRA. The MIRR did not provide the ECO with any methodology or evidence to show that 60% (or any) of this initiative would reduce GHGs, to justify allocating even \$3 million from the GGRA.

First Nations communities are suffering significant climate change impacts (due, for example, to the reduction in northern ice roads). They need government support to adapt. However, it is equally clear that the *Climate Act* requires cap and trade proceeds to be used for GHG reductions, not for adaptation.¹⁹ The ECO understands that the MIRR is now aware that GGRA funds cannot be used for adaptation.

Under its Social Housing Electricity Efficiency Program (SHEEP), the Ministry of Housing gave \$10 million of GIF funds to social housing providers to reduce electricity consumption in low-rise public housing connected to the electricity grid. Because of Ontario's low-carbon electricity grid, reducing total electricity consumption is not an effective way to reduce GHG emissions.

Ontario's grid-based electrical system has low GHG emissions because most generation sources are low-carbon (i.e., hydro, nuclear).²⁰ Less than 10% of Ontario's electricity is generated from fossil fuels, i.e., releases GHGs. As a result, most of the time, electricity

MOST OF THE TIME, ELECTRICITY CONSERVATION DOES NOT REDUCE GREENHOUSE GASES

conservation does not reduce GHGs. Only when there is high electricity demand (e.g., on hot summer weekdays, and on the hottest and coldest nights), is a significant portion of electricity generated by natural gas plants, which do release GHGs. As a result, many typical electricity conservation efforts, such as replacing inefficient lights with LEDs, do little to reduce current GHG emissions.²¹

Electricity conservation efforts that are focused on reducing usage during times of peak demand (such as air conditioning) can be more effective at reducing GHGs.²² As we indicated in our commentary on the draft *Ontario Public Service Guidance Document*:

A good example of the difficulties when balancing simplicity with accuracy is found in the draft Guidance Document's recommendation to estimate electricity emissions based on the average mix of electric power generation in Ontario.... Because the Ontario electrical system has no GHG emissions about two thirds of the time, [and emissions] vary significantly depending on the time of year and time of day, this methodological choice will distort the predicted reductions:

 All electricity conservation initiatives will show very low GHG emissions-reduction potential, including those that would displace natural gas fueled generation.

- Any type of fuel switching to electricity from fossil fuel will show very high GHG emissionsreduction potential, which will be overstated for electrical usage when gas-fired generation is at the margin.
- The... potential for GHG emissions reductions from switching the timing of electricity use (e.g., load shifting, overnight electric vehicle charging) will be ignored.

The ministry's final guidance document indicates that the MOECC will work with stakeholders to develop appropriate GHG emission factors.²³ The ECO strongly supports developing these emissions factors and adding it to the document and internal framework as soon as possible. This is an important criteria for evaluating and prioritizing projects for GGRA funding.

SHEEP funds were not focused on peak demand reductions, and could be used to replace lighting with LEDs. Most lighting is used primarily at night, when natural-gas fired electricity generation is rare, i.e., when electricity conservation is not likely to reduce GHGs. Even if electricity conservation in social housing produced some small GHG reductions, it would be difficult to attribute these reductions to SHEEP itself, as opposed to the strong electricity conservation initiatives offered by local electric utilities, and/or the price pressure to reduce electricity use.

SHEEP was also a high-cost means of pursuing GHG reductions. The ministry estimated the potential GHG reduction of SHEEP at 9,700 tonnes, an estimate the ECO does not consider reliable because it was based on average, not actual, time of use emissions. Even if this were achieved, at a cost of \$10 million, this would mean paying \$1,031 for every tonne of reductions.

For comparison, in Ontario's first four auctions, GHG allowances sold for less than \$19 per tonne, approximately one fiftieth of the cost.

Accordingly, although SHEEP may be valid social policy, the ECO cannot conclude that it was a proper use of GGRA funding. The Ministry of Housing advised the ECO that it will not seek any further GGRA funds for SHEEP.

The ECO is happy to see that other GGRA initiatives from the Ministry of Housing (e.g., the Social Housing Apartment Improvement Program) have a stronger focus on reducing fossil fuel use. Social housing pilot projects can showcase innovation, support research and development, and reduce the price of Ontario technology for wider market adoption, while also reducing operating costs and increasing comfort for vulnerable communities who are disproportionately impacted by both carbon pricing and climate change.

5.5.2 2017 GGRA Initiatives: No Doubtful Projects

The 18 approved GGRA initiatives described in Section 5.2.2 do meet the minimum test, in that they are likely to support the reduction of GHG emissions. Therefore, in the ECO's view 99% of the GIF/GGRA funds allocated up to November 2017 were allocated to initiatives that met the minimum test.

IN TOTAL, 99% OF FUNDS ALLOCATED MET THE MINIMUM TEST

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5.6 Step 2: Making GGRA Initiatives More Effective

The fact that most of the initiatives pass the minimum test is a good start. But Ontarians want more than that. Ontarians want to know that GGRA funds are being used *wisely*, to achieve maximum reductions in Ontario's GHG emissions and to support progress towards a low-carbon economy. This will be a larger focus in the ECO's greenhouse gas progress report next year.

ONTARIANS WANT TO KNOW THAT GGRA FUNDS ARE BEING USED WISELY



In the time available this year, we did not have sufficient documentation or time to examine the effectiveness or cost effectiveness of the individual initiatives. Instead, we looked at the process that the province uses to evaluate and select projects for GGRA funding, and to monitor how these processes perform. The GGRA funding process is better than it was in 2016, but still needs significant improvement. The GGRA funding process should:

- 1. Consistently quantify expected GHG reductions;
- 2. Demonstrate that these reductions will be additional beyond existing programs;
- 3. Calculate and give weight to cost effectiveness;
- 4. Review interactions with existing programs; and

5. Clearly tie the money spent to the results that must be achieved, including an analysis of impacts across economic sectors and income levels.

Ideally, ministries and sectors should each have an explicit and steadily declining carbon budget, and transparently account for how they achieve it.

THE GGRA FUNDING PROCESS IS BETTER THAN IT WAS IN 2016, BUT STILL NEEDS SIGNIFICANT IMPROVEMENT



5.6.1 Quantifying Projected GHG Reductions

Government ministries now have a standard methodology for calculating projected GHG emissions under various scenarios in the *Ontario Public Service Guidance Document for Quantifying Projected and Actual Greenhouse Gas Reductions* (the OPS Guidance Document, see Section 5.1.3). Since this was launched in June 2017, after most of the 2017 GGRA projects had been planned and approved, it was no surprise that the background documentation for the 18 approved GGRA projects shows a wide range of methods used to estimate emissions reductions, with varying levels of confidence in their accuracy. For example, few ministries used explicit baseline scenarios, identified sources and sinks, or were able to demonstrate that their projects met the *additionality* tests (see Section 5.6.2).

The ECO expects to see the guidance document used consistently across ministries in future years of GGRA funding.



The Ontario Public Service Guidance Document lays out a clear approach to the concept of additionality, i.e., that emissions reductions to be achieved by a GGRA initiative would not have occurred otherwise. The recommended approach includes calculating a project baseline (the GHG emissions that would have been released under a *no initiative* scenario), and several *additionality tests* (based on program timing, legal and regulatory requirements, and presence of technology and financial barriers). As we pointed out in *Facing Climate Change*, the primary justification for the creation of the GGRA is the claim that GGRA funding is necessary to produce *additional* GHG reductions.

Additionality

There is a difference between project-based additionality and whether GGRA funding as a whole provides additional GHG reductions. *Project-based additionality* means that, assuming all other factors remain constant (including whether the cap is binding), the observed or projected GHG reductions would not have happened without the project. Various assumptions must be made, and therefore an inherent amount of uncertainty is associated with creating such counterfactual scenarios, but they are nevertheless an important screen when allocating GGRA funds. A separate question is how GGRA initiatives interact with the cap on allowances. This interaction is described in Section 5.3.²⁴

Few of the projects approved to date appear to have been screened for additionality, according to project documentation seen by the ECO. Only one, the 50 Million Trees program, is likely to drive further GHG reductions than the cap alone is designed to deliver – because it is not directed at reducing the use of fossil fuels that are already controlled by the cap on allowances. The ECO will be conducting a more thorough analysis of additionality claims in a future report.

5.6.3 Cost Effectiveness and Other Impacts

As the ECO pointed out in *Facing Climate Change*, GHG reductions cannot be the only factor used in evaluating potential GGRA initiatives. Cost effectiveness, for example, is needed to ensure that the relatively limited funds are not frittered away on costly, inefficient projects.

Unlike California's cap and trade program, and Canada's federal Low Carbon Economy Fund,²⁵ Ontario's *Climate Act* does not explicitly include cost effectiveness in its list of mandatory evaluation criteria for GGRA initiatives. In fact, many important factors are missing, such as the permanence of reductions, and initiatives' environmental, economic or health impacts.

The province's internal GGRA evaluation framework gives the following factors limited weight as part of its *qualitative* criteria:

- · Cost effectiveness and value for money;
- Estimated innovation, science and technology impacts;
- · Estimated behavioural change impacts;
- Estimated co-benefits (but not damage): economic, productivity, infrastructure, energy, environmental, social and First Nations and/or Métis; and
- Estimated leverage/collaboration/partnerships.

This is a good start, but these factors deserve more weight. Cost effectiveness, in particular, should become a quantitative, not merely a qualitative, factor, even though it is difficult to quantify with precision.

The ECO recognizes that too much emphasis on shortterm cost effectiveness would unfairly disadvantage initiatives with important but indirect or longer-term effects, including research, development, capacity building and standards development. For example, some initiatives, such as subsidies for the purchase of electric vehicles, may have relatively high per-tonne costs, but should help to contribute to a long-lasting cultural change in the acceptance of electric vehicles. Electrification of transport is an important part of Ontario's long-term fossil fuel reduction strategy. On the other hand, there may be more cost-effective ways of encouraging uptake of electric vehicles. We saw no evidence that the government compared the cost effectiveness of alternate approaches before deciding on the current purchase subsidies.

5.6.4 Overlap Between GGRA Initiatives and Other Programs

Another ongoing issue is how to attribute a specific number of GHG reductions to specific initiatives, which is essential for cost effectiveness evaluations. This is especially problematic for GGRA initiatives that overlap with existing programs, such as utility programs aimed at reducing fossil fuel use in buildings. It is difficult to distinguish the effects of multiple initiatives occurring at the same time aimed at the same emissions from the same emitters.²⁷

The ECO has not seen clear recognition of this issue by the province in any of the documentation provided to date, nor any procedures to collect appropriate verification data. We will expect to see this much better documented in future GGRA years.

5.6.5 Tying Money to Results

By next year, the ECO expects to see a coherent plan for tying GGRA funding decisions to the GHGreduction targets in the *Climate Act* and to the GHGreduction responsibilities of each ministry. This will allow a much better analysis of the cost effectiveness of GGRA initiatives, and of other implications for Ontario's environment and economy. Ideally, ministries and sectors should each have an explicit and steadily declining carbon budget, and transparently account for how they use GGRA and other government funds to achieve it.

The Future of the GGRA

As the ECO went to press, the Ontario New Democratic Party (NDP) had indicated its support for cap and trade, whereas the Ontario Progressive Conservative (PC) Party had announced a commitment to replace the cap and trade program with a federally administered carbon tax, as part of the two parties' respective 2018 election platforms. We explored the pros and cons of these two approaches to *raising* revenue in our 2016 report.²⁸ Regardless of the system used, the ECO firmly believes that Ontario must continue to put a price on carbon that rises in a steady and predictable way.

When it comes to *spending* the proceeds from carbon pricing, the NDP proposes to dedicate 25% to support vulnerable communities and individuals, and to protect workers in trade-exposed industries. The PC party proposal is to return the proceeds to individuals and businesses in the form of lower taxes, instead of putting them into the GGRA to support projects that reduce emissions. It is important that the money raised by carbon pricing is used wisely, and the ECO expects to explore this in next year's report.

5.7 The Biggest Impact of the GGRA: Changing **Government Awareness**

As the ECO reported in Facing Climate Change, we do not expect GGRA-funded initiatives to do everything that the government claimed in the CCAP by 2020 - the year of the next GHG-reduction target. 2020 is just around the corner. Ontario is large and complex, and it will take time to make the pervasive structural changes to the energy foundation of our economy that a low-carbon province will require. GGRA initiatives and the Climate Change Action Plan can best be viewed as the first steps on a long road. The emissions reductions that Ontario requires would have cost much less if we had started a decade or two ago; starting now will cost much less than if we put off action another decade.

Meanwhile, the most important impact of the GGRA is the change it has triggered, both within and outside government, in understanding Ontario's GHG emissions and the opportunities to reduce them. The process of competing for GGRA funds, as well as presentations on climate science by the ECO, has improved key ministries' understanding and awareness of climate issues, an understanding that is starting to affect a broader range of government actions.

THE MOST IMPORTANT IMPACT OF THE GGRA IS THE CHANGE IT HAS TRIGGERED, BOTH WITHIN AND OUTSIDE GOVERNMENT, IN **UNDERSTANDING ONTARIO'S** GHG EMISSIONS AND THE **OPPORTUNITIES TO REDUCE THEM**



5.8 Conclusion and **Recommendations**

To date, most GGRA initiatives pass the minimum test, in that they are likely to support the reduction of GHG emissions from fossil fuels by reducing the cost of staying below the cap. But the ECO believes Ontarians want to know that carbon pricing proceeds are being used wisely, i.e., to achieve maximum reductions in Ontario's GHG emissions and to support progress towards a low-carbon economy. This will be a larger focus in the ECO's next greenhouse gas progress report.

While GGRA funding has the potential to lower the cost of GHG reductions for individuals or businesses, and facilitate the transition to a low-carbon economy, the impact of GGRA initiatives on Ontario's overall emissions depends on interactions with cap and trade, and the total number of allowances bought and sold. If the cap is binding (i.e., no excess allowances), most GGRA initiatives approved to date would not drive further overall reductions because they mainly target emissions from fossil fuels that are covered by the cap.



However, should there be an oversupply of allowances (see Chapter 3), then these GGRA initiatives have the potential to encourage some net reductions in Ontario. The likelihood of oversupply is larger since January 2018, when Ontario joined California and Quebec's linked carbon market.

Regardless, Ontarians deserve to know that carbon pricing revenues are being allocated using a transparent, fair, and rigorous methodology, that ties GGRA funding decisions to the GHG-reduction targets in the *Climate Act* and to the GHG-reduction responsibilities of each ministry. By next year, Ontarians should see metrics to measure impacts of GGRA initiatives, including a clear analysis of the cost effectiveness, and of their other implications for Ontario's environment and economy.

For now, the most important impacts of the GGRA are the changes it has triggered, both within and outside government, in understanding Ontario's GHG emissions and in opportunities to reduce them. In isolation, the relatively small amount of GGRA funding will have a limited impact. If the government reinforces the GGRA funding with a much stronger climate lens on its other economic and regulatory decisions (which have a far bigger impact on Ontario's GHGs), it can accelerate progress toward its low-carbon goals. Each ministry and sector should have an explicit and steadily declining carbon budget tied to Ontario's climate targets, and should transparently account to the public for how they use GGRA and other government funds to achieve it.

This accounting should, at least for major expenditures, include a comprehensive assessment of the impact of each initiative on the public interest, including GHG reductions, cost effectiveness, impacts on low-income and vulnerable communities, and environmental, economic and health effects.

Endnotes

- The need for accountability was underscored by the government's announcements that it would use up to \$1.3 billion of cap and trade proceeds to subsidize electricity rates, without any evidence that this would reduce GHGs. After the ECO's 2016 climate change report, the government wisely abandoned this idea. See: Environmental Commissioner of Ontario, *Facing Climate Change*, Annual Greenhouse Gas Progression Report – 2016 (Toronto: ECO, November 2016) at 118-121.
- 2. Ibid, at 97.
- GHG emissions-reduction targets have been set for 2020, 2030, and 2050. Initiatives that will reduce GHG emissions over any of those time frames are eligible for funding.
- 4. The allocated funding is \$6 million less than the \$325 million announced because two GIF projects were underspent: (1) The Ministry of Energy received \$8m for its Smart Grid Fund (to support renewable energy projects in First Nations communities), but returned \$4 million because two micro-grid projects "met significant financial and technical barriers and were unable to move forward": Ontario Ministry of Energy, information provided to the ECO in response to ECO inquiry (July 24, 2017); (2) the Ministry of Indigenous Relations and Reconciliation received \$5 million to "support Indigenous communities", but as some projects related to adaptation and were not eligible for GGRA funding, just 60% (\$3 million) was taken from the GGRA: Ontario Ministry of Indigenous Relations and Reconciliation, information provided to the ECO in response to ECO in response to the ECO in response to ECO in the GGRA: Ontario Ministry of Indigenous Relations and Reconciliation, information provided to the ECO in response to ECO in the ECO in response to ECO inquiry (July 26, 2017).
- 5. Amount includes \$319 million in funding through the Green Investment Fund (GIF) which will be reimbursed from the GGRA.
- Ontario Ministry of Finance, "Leading in the Green Economy", in *Building* Ontario Up – Progress for Prosperity: Ontario Economic Outlook and Fiscal Review, Background Papers (Toronto: Queen's Printer for Ontario, 2015).
- Original allocation for the Smart Grid Fund was \$8 million. See endnote 4 for an explanation of the discrepancy.
- 8. Original allocation to support Indigenous communities was \$5 million. See endnote 4 for an explanation of the discrepancy.
- "How Cap and Trade Works", online: Ministry of the Environment and Climate Change <<u>https://news.ontario.ca/ene/en/2016/11/how-cap-and-trade-works-1.html</u>> [Accessed December 8, 2017]
- 10. Fossil fuel use accounts for about 82% of Ontario's GHG emissions.
- 11. Offset credits are additional to this, see Chapter 4.
- 12. In other words, the demand for allowances should always just equal the fixed cap, if the price of allowances can move (i.e., is not at the price floor). Firms can be expected to reduce emissions when the cost of abatement (emissions reduction) is cheaper than the cost of an allowance. As illustration, let's say that allowances are trading at \$20/tonne. Further, let's assume an aluminum smelter can reduce emissions by taking actions that cost \$18/tonne. The smelter operator saves money by spending \$18/tonne to reduce emissions and avoids having to retire some allowances. After all, by reducing emissions the smelter operator can sell those allowances for \$20/tonne on the open market and realize a \$2/tonne profit. Firms for whom the cost of cutting emissions. The cap fixes the amount of emissions from the covered sector (ignoring trading with other cap and trade systems and offsets for the moment). Now say a GGRA-funded initiative reduces emissions

from a cement manufacturer by 1,000 tonnes/year. How does that affect the allowance market? The supply of allowances is unchanged but at the current allowance price of \$20/tonne, demand for allowances falls by the 1,000 tonnes saved by this cement manufacturer. That means that we now have an excess supply of allowances at \$20/tonne. Some allowances (that firms would like to sell) won't get sold at the current price. The only way to clear the market is to lower the price. As the price goes down, some firms that would have taken steps to reduce emissions will purchase allowances instead - like our hypothetical aluminum smelter. If the allowance price falls to \$17/tonne, the smelter operator will find it profitable to limit actions it takes to reduce emissions (that cost \$18/tonne) and simply buy and retire allowances (at \$17/tonne) instead. Eventually, the price should drop just enough so that the reduction in emissions due to the GGRA-funded initiative at a covered firm is exactly offset by increased emissions from other covered firms. Thus, in general, GGRA spending on programs to reduce emissions covered by Ontario's cap and trade program should reduce the price of allowances in the cap and trade system to the point where allowance demand exactly equals the emissions cap (and supply of allowances).

For more information, see: Levinson, Arik. 'Belts and Suspenders: Interactions among Climate Policy Regulations' in Don Fullerton & Catherine Wolfram, eds, The Design and Implementation of U.S. Climate Policy (Chicago: University of Chicago Press, 2012); Metcalf, Gilbert. 'Comment on Belts and Suspenders' in Don Fullerton & Catherine Wolfram, eds, The Design and Implementation of U.S. Climate Policy (Chicago: University of Chicago Press, 2012).

13. Why don't subsidies to reduce fossil fuel use also reduce total capped emissions?

Subsidies can reduce the emissions from a particular activity (e.g., heating a building). This would result in fewer allowances being required to cover its emissions. However, this would also free up more allowances to cover other emissions (e.g., from driving a car). This is because allowances can be used for any capped emissions and are not limited to individual activities or companies. Therefore, subsidies decrease the need to reduce emissions from unsubsidized activities. Subsidies would not change the total number of allowances available for all capped emissions.

Why do capped emissions equal the number of allowances available?

The need for allowances for all capped emissions increases the cost of GHG-intensive activities. Individuals and companies can respond by reducing emissions or paying more while others reduce emissions. The more reluctant individuals and companies are to reduce their emissions, the higher the allowance price. Conversely, the more willing individuals and companies are to reduce emissions (e.g., because of subsidies), the lower the allowance price. Allowance prices can move up and down until total capped emissions equal the number of allowances available.

How do allowance prices limit emissions when some allowances are free?

The cap is based on the total number of both free and sold allowances provided by the government. All allowances are equally valuable because unused allowances can be sold to other companies. Those who must pay for allowances are encouraged to reduce emissions to *save money*, while those with free allowances are encouraged to reduce emissions to *make money*. The value of reducing one tonne of emissions is identical regardless of how allowances are obtained. This value is the price of allowances on the market, which increases until total capped emissions equal the number of allowances available.

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How will companies reduce their emissions without being subsidized or forced?

Although companies can also choose to not to reduce emissions, high allowance prices can force them to adapt to stay in business. Even low allowance prices can impact the profitability of GHG-intensive businesses. To improve profitability, companies could consider investing in less GHG-intensive machinery (e.g., things that could be subsidized). Companies could also reduce GHG-intensive activities (e.g., turning off GHG-intensive machinery when not in use). The choice exists because allowance prices encourage (but do not force) all companies to choose the most cost effective means to reduce their emissions to maximize profitability.

How will individuals reduce their emissions without being subsidized or forced?

Although individuals may be reluctant to reduce emissions, high allowance prices can force them to adapt in some way due to financial constraints (i.e., income, savings and credit limits). Even low allowance prices reduce affordability of GHG-intensive activities. Drivers could consider investing in an electric car (e.g., thing that could be subsidized). Drivers could also choose a more efficient gasoline vehicle, drive less often or car pool. Drivers could also reduce costs in other ways (e.g., fly less often, adjust thermostat) to avoid changing driving habits. The choice exists because the allowance price encourages (but does not force) individuals to choose the most cost-effective means to reduce their emissions to minimize disruption of their lifestyle.

- 14. If the cap is not binding (i.e., allowances are selling at the floor price which indicates an excess of allowances), GGRA funding could reduce overall emissions by providing financial assistance to reduce emissions.
- 15. Subsidies to reduce GHG emissions, such as through GGRA funding, must be carefully designed to ensure they are complementary to carbon pricing policies, and avoid increasing overall costs (e.g., by shifting GHG reductions towards activities with a higher cost per tonne). For more discussion of these points, see: Canada's Ecofiscal Commission, Supporting Carbon Pricing (Montreal, 2017); California Legislative Analyst's Office, Cap-and-Trade Revenues: Strategies to Promote Legislative Priorities (Sacramento, CA, 2016).
- 16. Chapter 2 of this report discusses the status of non-GGRA CCAP commitments, i.e., climate-related policies and regulations.
- 17. Ontario Ministry of Energy, information provided to the ECO in response to 2016 Annual Greenhouse Gas Progress Report, online: Environmental Commissioner of Ontario <<u>https://media.assets.eco.on.ca/web/2016/11/</u> Ministry-formal-comments-English-compiled-for-webpage.pdf>
- 18. In contrast, California limits confusion by setting legislative buckets within which its cap and trade revenues must be spent (e.g., 25% for low-income communities), see: "Cap-and-Trade Auction Proceeds Second Investment Plan: Fiscal Years 2016-17 through 2018-19," online: California Air Resources Board <<u>https://www.arb.ca.gov/cc/</u> capandtrade/auctionproceeds/16-17-updated-final-second-investmentplanii.pdf> at 22.
- 19. Adaptation to climate change is likely to be enormously expensive and could easily consume the entire cap and trade proceeds.
- 20. This is the case since the closure of the coal plants. In some remote communities, electricity is generated by burning diesel. In such locations, electricity conservation would always conserve diesel and therefore would always produce GHG reductions.

- 21. However, many electricity conservation measures will deliver savings for a decade or more. Emissions reductions may be higher in future years, depending on Ontario's electricity supply choices.
- 22. The GHG impact of increase/decreases in electricity use will depend on the marginal electricity generation source, which will usually have a higher emissions intensity than the average. In the near term, this can be predicted relatively accurately, as it will depend on Ontario's existing electricity generation sources. Over the longer term, it will depend on the choices Ontario makes for future electricity resources.
- 23. Default GHG emission factors are used by Ontario and other jurisdictions to quantify the amount of GHGs produced from fuel combustion or electricity use. GHG emissions for project or baseline scenarios are calculated by multiplying the activity level (i.e., the amount of fuel or electricity use over a period of time) by the relevant emission factor(s). The total GHG reduction is then calculated by subtracting project emissions from baseline scenario emissions.
- 24. GGRA initiatives targeting capped emissions may drive additional reductions if the cap is not binding, i.e., there is an excess of allowances. This could be due to faster than expected mitigation, or the cap being set too loose. For a detailed explanation, see: Canada's Ecofiscal Commission, Supporting Carbon Pricing (Montreal, 2017) at 21.
- Cost-effectiveness is an express objective of the federal Low Carbon 25. Economy Fund. As outlined in Chapter 4 of the 2016 federal budget, "resources will be allocated towards those projects that yield the greatest absolute greenhouse gas reductions for the lowest cost per tonne." See: "Chapter 4 - A Clean Growth Economy," online: Government of Canada <<u>www.budget.gc.ca/2016/docs/plan/ch4-en.</u> html>
- There is no process for third-party validation of an initiative, other than 26. an informal MOECC committee and the minister's evaluation required by section 71 of the Climate Act.
- 27. Ontario electric utilities spend heavily on electricity conservation. For reasons already described, however, this is not likely to materially contribute to GHG reductions, unless targeted at peak times of demand when natural gas generation is likely to be displaced. Nevertheless, it is complex to distinguish between the effects of multiple initiatives aimed at reducing natural gas consumption, for example in buildings. Such initiatives include the conservation programs offered by natural gas utilities, the impact of the cost of emission allowances, the federal government natural gas appliance efficiency regulations, various voluntary programs predating the *Climate Act* (such as Race to Reduce), and the new incentives to be offered by the Green Ontario Fund.
- 28. "Appendix A: Introduction to Cap and Trade in Ontario", in ECO, Facing Climate Change (2016).
- 29. See Chapters 7 and 8 of this report for discussions on the importance of applying a climate lens to government decision making, and incorporating low-carbon considerations into procurement decisions.
- 30. Ontario Ministry of Finance, 2017 Ontario Budget: A Stronger, Healthier Ontario (Toronto: Queen's Printer for Ontario, 2017), at 219.
- 31. "Ontario's new Long-Term Energy Plan avoids tough questions on integrating energy and climate policy", online: ECO < https://eco.on.ca/ blog/ontarios-new-long-term-energy-plan-avoids-tough-questions-onintegrating-energy-climate-policy/> [Accessed November 30, 2017].

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Chapter 6 Freight Trucks

How can we reduce freight emissions?

Avoid trucking where possible, improve truck efficiencies, and shift away from fossil fuels

Abstract

Ontario's freight sector greenhouse gas (GHG) emissions have more than doubled since 1990, and continue to rise. These are predominantly from trucks, whose operational and design efficiency improvements have done little to offset huge increases in the weight and distance of freight trucked around Ontario.

Freight is essential to Ontario's economy, but reducing GHG emissions from freight is essential to the ambitious and justified GHG-reduction targets in Ontario's *Climate Change Mitigation and Low-carbon Economy Act, 2016*. Emissions-reduction opportunities are substantial and fall into three categories: *avoid* trucking where possible; *improve* diesel truck efficiency; and *shift* freight away from fossil fuel use.

Current and planned Ontario government policies on freight appear promising at first glance, but some, including subsidies for fossil natural gas trucking, are not likely to reduce emissions. Instead, the government should encourage the freight sector to avoid trucking where possible (e.g., through logistics and road pricing), improve diesel truck efficiency (e.g., through incenting the scrapping of older, less efficient diesel trucks), and shift freight away from fossil fueled vehicles (e.g., providing more targeted support for zero-emission trucks).



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6.0 Ontario has a Goods Movement Problem

Moving freight is essential to Ontario's economy, but reducing GHG emissions from freight is critical to achieving the ambitious and justified GHG-reduction targets in *Ontario's Climate Change Mitigation and Low-carbon Economy Act, 2016* (the "*Climate Act*"). The freight sector is the fastest growing source of Ontario GHG emissions. The drastic 117% increase since 1990 far surpasses the increase in other economic subsectors (Figure 6.1), and is continuing to rise.



Figure 6.1. Growth of freight sector GHG emissions has far surpassed that of all other Ontario economic subsectors with rising GHG emissions.

Source: Environment and Climate Change Canada, National Inventory Report 1990-2015: Greenhouse Gas Sources and Sinks in Canada (2017), Part 3, Table A12-7, page 82.

The growth in freight emissions is largely a result of increased loads carried longer distances in heavy-duty trucks (Figure 6.2). These include semi-trucks (i.e., tractor-trailers), dump trucks, and specialty trucks (e.g., those carrying cement or garbage). For simplicity, heavy-duty vehicles are the focus of this chapter, unless otherwise stated, and are referred to below as just *trucks*. Moving goods by these trucks is referred to here as *trucking*.



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Source: Natural Resources Canada, Comprehensive Energy Use Database (2016), Transportation Sector, Ontario, Table 8: GHG Emissions by Transportation Mode.



Photo credit: Danielle Scott.

GHG emissions from trucking in Ontario have been growing at a rate of about 0.5 megatonnes (Mt) annually since 1990 and reached 11 Mt in 2014. At this rate, this one source of emissions is on track to use up the 2050 emissions-reduction target for the entire province – in other words, Ontario would only be able to meet its target by eliminating all other emission sources. Current and planned Ontario government policies to reduce freight emissions appear promising at first glance, but as we discuss below, some are unlikely to reduce emissions. Some can actually make things worse.

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GHG EMISSIONS FROM TRUCKING ARE ON TRACK TO USE UP THE 2050 EMISSIONS-REDUCTION TARGET FOR THE ENTIRE PROVINCE



Figure 6.3. Trucking emissions are on track to equal the 2050 emissions-reduction target for the entire province. Source: Natural Resources Canada, *Comprehensive Energy Use Database* (2016), Transportation Sector, Ontario, Table 8: GHG Emissions by Transportation Mode.

6.0.1 Why are Trucking Emissions So High?

Everyone relies on trucks because almost everything we use is delivered this way. This has resulted in the steady rise in freight GHG emissions in Ontario and elsewhere.

There is a strong correlation between trucking demand and economic growth in Ontario (Figure 6.4) and around the world. EVERYONE RELIES ON TRUCKS BECAUSE ALMOST EVERYTHING WE USE IS DELIVERED THIS WAY



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Figure 6.4. Trucking demand in Ontario is related to economic growth.

Source: Natural Resources Canada, *Comprehensive Energy Use Database* (2016), Transportation Sector, Ontario, Table 36: Medium and Heavy Truck Secondary Energy Use and GHG Emissions by Energy Source; Statistics Canada, *Gross domestic product, expenditure-based, provincial and territorial* (2016), CANSIM Table 384-0038.

Many factors contribute to our dependency on trucks. Trucks are used for domestic shipments and U.S. trade. Just-in-time delivery has allowed many businesses to reduce the money and space devoted to inventory, while increasing the range of goods available. Online shopping is increasingly bringing small delivery trucks to our front doors.

Trucks are flexible, ubiquitous and comparatively cheap. Diesel trucks can be easily refueled across the province, giving this fuel a tremendous advantage over less carbon-intensive fuels. Diesel is also energy dense, which allows more cargo to be carried – thus increasing revenue – while remaining within weight restrictions. Energy dense fuels also allow trucks to travel longer distances without stopping to refuel, allowing faster deliveries. Trucks have the advantage of a vast road network to make both intercity and inner-city deliveries door to door. Though most truck trips in Ontario start and/or end in the highly populated Greater Golden Horseshoe region, trucks can reach almost everyone in the province.

Trains and boats are more energy efficient and less carbon intensive at moving freight (Figure 6.5) than trucks, but also slower. Rail and marine infrastructure is less expansive than road infrastructure, so cargo on trains and boats usually require transfers with trucks to get to and from rail terminals and marine ports.



Figure 6.5. Moving goods by heavy truck is more GHG intensive than by boat or rail, but less GHG-intensive than by plane.

Source: Natural Resources Canada, Comprehensive Energy Use Database (2016), Transportation Sector, Ontario, Table 8: GHG Emissions by Transportation Mode

Emissions from trucking can be broken down into three fundamental pieces of the puzzle shown in Figure 6.6; trucking demand, truck efficiency and fuel emissions intensity. Since 1990:

• Trucking demand has increased rapidly;

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- Truck energy intensity has decreased (i.e., efficiency has increased) slowly; and
- Trucks continue to use carbon-intensive diesel.

THREE FUNDAMENTAL PIECES OF THE PUZZLE: TRUCKING DEMAND, TRUCK EFFICIENCY AND FUEL EMISSIONS INTENSITY



Figure 6.6. The growth of heavy truck GHG emissions has been driven by increased demand.

Source: Natural Resources Canada, Comprehensive Energy Use Database (2016), Transportation Sector, Ontario, Table 36: Medium and Heavy Truck Secondary Energy Use and GHG Emissions by Energy Source.

Freight Trucks

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6.0.2 Can Trucking Emissions Be Reduced?

Yes, trucking emissions can be reduced. Major logistics firms around the world already recognize that trucking emissions can and must be dramatically reduced. A coalition of non-governmental organizations have launched a '35 by 35' campaign through the Global Fuel Economy Initiative and aim to reduce truck fuel consumption 35% by 2035 from 2015 levels.

But it may not be easy. Ontario was able to drastically reduce its electricity sector emissions by closing publicly owned coal power plants. In comparison, the trucking industry has fragmented ownership, with tough competition and narrow profit margins,¹ which reduces truck owners' willingness and ability to invest in new technologies.² Thus, there are no comparable "silver bullets" to reduce freight sector emissions, but some proven tools will help.

The government could reduce trucking emissions with policies that help *avoid* trucking where possible (Section 6.1), *improve* diesel truck efficiency (Section 6.2), and *shift* freight away from fossil fuel use (Section 6.3).

Cap and Trade and Trucking

The GHG emissions from diesel-based trucking are capped under Ontario's *Climate Act*. This means fuel providers must purchase cap and trade allowances to cover these emissions. The total number of allowances available is reduced every year to keep capped emissions in line with Ontario's emissions-reduction targets. As the supply of allowances falls, the price of allowances (i.e., carbon price) may rise. Capped allowances and higher carbon prices should prevent trucking emissions from continuing to increase at their historical rate shown in Figure 6.3.

As explained in Chapter 5, additional policies targeting emissions from individual capped sectors, such as freight, are not likely to reduce Ontario's total capped emissions, as these emissions are controlled by the number of allowances. Subsidies and other policies that reduce fossil fuel use by some businesses or sectors free up allowances for others to use, which keeps carbon prices lower and decreases the need for other sectors to reduce emissions. Thus, none of the policies discussed in this chapter are likely to reduce Ontario's total capped GHG emissions. However, they could reduce fossil fuel used for trucking, which will be important to keep carbon prices from rising too quickly for other sectors to adjust.



The first opportunity is to avoid truck kilometres driven where possible (Figure 6.7).



Figure 6.7. Freight consolidation and reduced packaging could reduce the amount of truck kilometres driven.

New technologies can make this easier, for example, by helping reduce distances driven with an empty or partially empty truck. Status-quo shipping logistics can require days of telephone calls and negotiations.³ Uber Freight, Freightera and other companies use technology to quickly match available space on trucks with nearby loads needing space. Urban freight consolidation centers and better packaging/loading systems could also help better utilize trucks.

Trucking in a Low-Carbon Economy

Although trucking emissions must be reduced, the industry does have a role in a low-carbon economy. Trucking is just one part of complex supply chains. In some instances, long trucking distances can reduce overall emissions, e.g., by delivering products that are less carbon-intensive than those produced locally.⁴ Small delivery trucks may be increasingly relied on for home deliveries if Ontario reduces its level of personal vehicle ownership. However, in the long run, it is also essential to reduce the need for trucking through changes in procurement and consumer culture, such as purchasing low-carbon products locally, and purchasing fewer, better-quality products and making them last.⁵

6.1.1 Reducing Congestion

Aside from the obvious direct GHG benefit from reducing truck kilometres driven, it would also help alleviate the traffic congestion suffered by all drivers and therefore improve everyone's fuel efficiency. Even nondrivers suffer, because bottlenecks slow the economy.

Metrolinx estimated that congestion in the Greater Toronto and Hamilton Area costs commuters \$3.3 billion and reduces Ontario's annual gross domestic product by \$2.7 billion.⁶ The Toronto Region Board of Trade estimated that congestion in the Toronto-Waterloo corridor increases consumer prices (due to extra fuel, labour, etc.) by more than \$125 a year per household.⁷

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How Much Trucking Congestion? Where?

It is difficult to manage what is not measured and unfortunately there is limited data on trucking activity in Ontario. The trucking demand data shown in Figure 6.4 is province-wide, but congestion is a very localized problem. Only 30% of surveyed Ontario municipalities have any data on goods movement activity.⁸ The Ministry of Transportation's Commercial Vehicle Survey provides additional detail about provincial highways but it was last conducted in 2012.

Metrolinx used to have a greater focus on freight transportation. This included a dedicated staff member who regularly engaged with stakeholders via the Urban Freight Forum. This initiative resulted in the release of the GTHA Urban Freight Study back in 2011 and a plan by University of Toronto researchers to collect data, which was released in 2013. This staff member has since left Metrolinx without being replaced by another freight-focused employee.

Renewed government leadership and improved data on trucking in Ontario would help identify solutions. Other organizations have attempted to fill the void. The Region of Peel is helping to lead the development of a Smart Freight Centre to engage with a range of stakeholders. The Pembina Institute has initiated forums and produced a series of reports studying goods movement, with a particular focus on the Greater Toronto and Hamilton Area. The provincial government is responding to congestion by building roads to create room for additional traffic, in the hope of supporting economic growth. Most visible is the construction of Highway 412 and the extension of Highway 407.

The government is also encouraging municipalities to increase truck capacity on local roads. *Freight-Supportive Guidelines* were developed with land use planning and other suggestions to facilitate truck traffic. A toolkit was also produced based on the provincial off-peak delivery pilot program. This pilot helped Ontario's roads absorb additional traffic during the 2015 Pan Am Games.

ADDING NEW ROAD CAPACITY WILL SIMPLY RESULT IN MORE TRANSPORTATION GHG EMISSIONS

6.1.2 Building Roads

Unfortunately, adding new road capacity will simply result in more transportation GHG emissions.

First, new roads in busy areas do not reduce congestion. In theory, making more roads for traffic could reduce congestion *if* traffic volumes did not increase, but in practice congestion does not drop in busy areas with pent up or growing demand,⁹ such as the Greater Toronto and Hamilton Area.¹⁰ That is, congestion deters some driving. Opening new road capacity in busy areas briefly reduces congestion, which encourages more people to drive and to drive farther; this increases traffic until congestion chokes it again. California offers some classic examples of how adding road capacity does not reduce traffic congestion.¹¹ Second, even if they could permanently reduce congestion, new roads increase transportation GHG emissions because they allow more people to drive and to drive farther. This far outweighs the transportation GHG-reduction benefits of cutting congestion. One study found a 10% reduction in traffic delays reduces trucking GHG emissions by just 0.25%.¹²

Increasing total vehicle distance driven can increase transportation GHG emissions more than reducing congestion for existing vehicles cuts emissions, unless and until every vehicle is emission-free.

6.1.3 Pricing Roads

The government has a quick, powerful, and proven tool to decrease trucking demand for road capacity, especially during peak traffic hours: well-designed road pricing. Road pricing has successfully been introduced on Ontario Highway 407 and Highway 412. More comprehensive and better-designed road pricing (widespread, and varying with both distance and congestion) would reduce traffic congestion.¹³ Although road pricing alone can create economic benefits,¹⁴ revenues can also be used to offset other financial burdens on road users or to fund complementary measures, as discussed below.¹⁵

THE GOVERNMENT HAS A QUICK, POWERFUL, AND PROVEN TOOL: WELL-DESIGNED ROAD PRICING



The Price of Driving

All drivers help to pay for Ontario's roads, but it is debatable whether they are paying the right amount and whether the government properly uses the resulting revenue. What is clear is that the fees and taxes drivers pay are not designed to manage congestion.

First, provincial license and registration fees are fixed costs. For example, the annual commercial truck license plate sticker fee is up to \$4,493 (depending on vehicle weight). These fees are the same no matter how far vehicles are driven or how busy the roads are, so they give road users no incentive to drive less or during times with less congestion. (Nor do these fees incentivize the purchase of lower emission vehicles, as fuel taxes and carbon prices do).

Second, provincial and federal fuel taxes are based on fuel use (Figure 6.8). These taxes do modestly encourage less driving (to use less fuel and, therefore, pay less tax) and driving during times with less congestion (since congestion can increase fuel use). However, the impact is small and is diminishing as vehicles become more efficient.



Provincial Fuel Tax

Provincial Carbon Price Federal Excise Tax

Figure 6.8. Provincial fuel tax, provincial carbon price and federal excise tax as fraction of average January 2017 diesel price in Toronto.

Source: Statistics Canada, Average retail prices for gasoline and fuel oil, by urban centre (2017), CANSIM Table 326-0009; Natural Resources Canada, Fuel Consumption Taxes in Canada (2017), Current Fuel Tax Rates; Government of Ontario, Cap and trade in Ontario (2017), Gasoline and diesel.

Freight Trucks



Similarly, the cap and trade program adds a carbon price to fuel costs. To date the impact on fuel costs, and therefore congestion, is very small; far smaller than that of fuel taxes (Figure 6.8) and of market fluctuations in fuel prices (Figure 6.9). While this may change when allowance prices rise, the potential impact on congestion may be partly offset as vehicles become more efficient and begin to use alternative fuels. Changing how drivers pay to use Ontario's roads, as proposed in this chapter, could reduce congestion even if overall costs do not change.



Figure 6.9. Historical diesel price in Toronto.

Source: Statistics Canada, Average retail prices for gasoline and fuel oil, by urban centre (2017), CANSIM Table 326-0009; Government of Ontario, Cap and trade in Ontario (2017), Gasoline and diesel.

Road pricing works best when it is widespread, across much of the road network. Ontario's current practice, applying road pricing only to a few select highways, means that most drivers avoid the tolls by using other roads. As a result, Highway 401, which is not tolled, is the busiest in North America. Traffic also spills over to other streets.

Widespread road pricing would create a financial incentive for industry to better utilize trucks and reduce the number of trips. Distance-based road pricing would encourage industry to reduce the distances that goods must be hauled. Today, just-in-time deliveries are typically made from remote warehouses where land is cheap. While this may reduce storage costs in urban areas, it comes at the expense of a heavy reliance on trucking many large loads long distances – "warehouses on wheels." Distance-based road pricing would change the economics of these decisions, and encourage production and/or inventory storage on-site or close by the final destination.

Pricing that varies with congestion can encourage truck traffic to shift to less congested times. Trucks that move smoothly without starts and stops are quieter and less polluting. Variable road pricing alone may not be enough to shift the timing of truck traffic,¹⁶ but could be combined with off-peak delivery initiatives to help industry adapt to nighttime deliveries. Funding to enhance these initiatives could be a good use for road pricing revenues.¹⁷ It should be noted, however, that off-peak delivery initiatives without congestion pricing could increase traffic and associated emissions by freeing up space during on-peak times.

On Highways 407 and 412, technology is already being used that sets prices based on distance, location and time (Figure 6.10). In contrast, Ontario's current High Occupancy Toll lane pilot project (on the Queen Elizabeth Way between Oakville and Burlington) does not have well-designed pricing. It charges a fixed price for unlimited use regardless of time of day, which does little to incent reductions in kilometres driven, or to move traffic off-peak. It therefore does little to reduce transportation GHG emissions. WIDESPREAD ROAD PRICING WOULD CREATE A FINANCIAL INCENTIVE FOR INDUSTRY TO BETTER UTILIZE TRUCKS AND REDUCE THE NUMBER OF TRIPS

1.40 Weekday 1.20 Weekend 1.00 \$/km 0.80 0.60 0.40 0.20 0.00 Midnight 3 AM 6 AM 9 AM Noon 3 PM 6 PM 9 PM Midnight

Figure 6.10. Highway 407 tolls are higher during times of higher traffic demand, and vice versa. Source: 407 ETR, *Heavy Multiple Unit Vehicle* (2017), Toll charges by day and time of travel: Zone 2 Westbound.

The government should prioritize road pricing and complementary investments to reduce traffic, instead of new highway construction, which increases traffic.

Road Pricing in the United Kingdom

Trucking demand has been decoupled from economic growth in the United Kingdom.¹⁸ In fact, GHG emissions from trucking are forecasted to gradually fall.¹⁹ One key factor has been the United Kingdom's effective use of road pricing.

First, a *heavy goods vehicle road user levy* is charged for road use in the United Kingdom. The levy is up to £10 (~\$17) per day. The costs for domestic trucks were offset by a reduction in the annual Vehicle Excise Duty (akin to the Ontario license plate sticker fee). The change garnered support by redistributing road maintenance costs to drivers of all trucks, including, for the first time, trucks registered out of the country.

Second, a *Low Emission Zone* encompasses a portion of Greater London. It is designed to reduce the emissions of several pollutants from larger diesel vehicles. *Heavy goods vehicles* entering this zone must pay a £200 (~\$340) daily fee or meet strict particulate matter and nitrogen dioxide emission requirements. All revenues are dedicated to transportation system maintenance and improvement. The result has been an increase in the fleet turnover rate (discussed in section 6.2.2) because newer, cleaner trucks can meet the pollution requirements while older, high-emission trucks must pay the fee.²⁰

Third, a *Congestion Charge Zone* in central London is applicable during weekday mornings and afternoons. The fee is £11.50 (~\$19) per vehicle regardless of vehicle class, with exemptions for vehicles with tailpipe GHG emissions below a threshold. These revenues are also used to maintain and improve the transportation system. As a result, vehicle traffic decreased 26% from 2002 to 2006.²² Delivery times may have also become more reliable.²³ For all these reasons, the provincial government should strongly encourage and support municipalities to implement local road pricing systems. It was *very* poor policy for the province to deny Toronto's request to charge road tolls, which would have been used to fund badly needed transit. Municipalities should be able to use road pricing to pay for their share of public transit investments in order to access federal infrastructure grants. Using road pricing to reduce private vehicle use and invest in alternatives, would allow all vehicles to operate with less congestion and thus more efficiently.

IT WAS VERY POOR POLICY FOR THE PROVINCE TO DENY TORONTO'S REQUEST TO CHARGE ROAD TOLLS

The government should allow municipalities to charge for the use of their roads.

6.2 Improving Diesel Truck Efficiency

The second opportunity is to *improve* diesel truck efficiency, i.e., to reduce diesel use per tonne-kilometre. Since 1990, trucks have become more efficient, as shown in Figure 6.11.





Source: Natural Resources Canada, *Comprehensive Energy Use Database* (2016), Transportation Sector, Ontario, Table 36: Medium and Heavy Truck Secondary Energy Use and GHG Emissions by Energy Source; Statistics Canada, *Average retail prices for gasoline and fuel oil, by urban centre* (2017), CANSIM Table 326-0009.

Fuel prices, which were generally rising until 2014, deserve part of the credit for incenting this increase in efficiency (Figure 6.11). The rest is due to government policy. The provincial government, for example, requires speed limiters in most commercial trucks and revised truck dimension regulations to allow rear-aerodynamic devices. The federal government encouraged efficiency improvements through the FleetSmart training program and SmartWay online benchmarking/performance comparison platform. The drop in fuel price since 2014 places increased importance on effective public policies to continue truck efficiency improvements.

Key operational and design improvements that have improved diesel truck efficiency include those shown in Table 6.1.





Table 6.1. Examples of truck design and operational improvements that have improved vehicle fuel efficiency.

Vehicle Technologies	Operational Improvements
Anti-idle electronic engine controls and diesel heaters	Driver fuel economy training
Aerodynamic hoods, fenders, bumpers, mirrors and tractor skirts	Speed limiting
Low rolling resistance tires and tire air pressure inflation systems	Routing optimization to reduce distance travelled
Lightweight aluminium wheels	Improved telematics and third party logistics to reduce empty loads
Low friction synthetic axle lubrication and transmission oils to reduce friction	Tighter packaging to allow more cargo to be carried on fewer trucks

Source: North American Council for Freight Efficiency, Annual Fleet Fuel Study (2016)

On the other hand, it is only fair to acknowledge that there was a dip in truck fuel efficiency caused by federal government air quality emission standards (Figure 6.12). To protect public health, these heavyduty truck and engine requirements were phased in between 2004 and 2010. As Figure 6.11 shows, these requirements decreased the average efficiency of the Ontario truck fleet for a few years, but truck efficiency rebounded by 2014. The relatively fast efficiency drop and recovery may reflect a historically short truck life of only 10 years, i.e., older trucks were removed from the road relatively quickly.²³ As discussed below, future trucks may last longer.



Figure 6.12. Heavy-duty vehicle and engine air quality emission standards phased in between 2004 and 2010. Nitrogen oxide and non-methane hydrocarbon requirements are shown here. Carbon monoxide and particulate matter emissions are also regulated. Emission control technologies to reduce these emissions protected public health but temporarily reduced heavy-duty truck fuel efficiency.

Source: TransportPolicy, Canada: Heavy-duty: Emissions (2016)

What will help improve diesel truck efficiency in the next decade, now that fuel prices are much lower?

The federal government began to phase in *Heavyduty Vehicle and Engine Greenhouse Gas Emission Regulations* in model year 2014. This policy requires continued new truck design improvements (as opposed to operational) over time. The federal government expects emissions targets will be achieved primarily with increasingly efficient trucks rather than fuel switching.²⁴

The provincial government could encourage increased efficiency simply by making freight efficiency more visible. For example, Vancouver-based Freightera has worked with the federal government to create the Low Emission Freight Marketplace. The platform has booked ~8,000 Canadian loads, most of them by rail or on certified SmartWay carriers, through an online system that requires disclosure of each trucking firm's GHG emissions.

Diesel truck GHG emissions can also be reduced by improving the diesel fuel. In 2014, the provincial government began to phase in requirements for a small portion of diesel fuel to be produced from biomass. Ontario's *Greener Diesel Regulation* requires the bio-based component to have 70% lower GHG emissions than petroleum diesel. This is a meaningful improvement. However, the bio-based fuel quota is only 4% of the total fuel volume, so this requirement only reduces the emissions of the entire fuel blend by 3%.

6.2.1 Green Commercial Vehicle Program Commitments

As part of its *Green Commercial Vehicle Program*, the provincial government will provide subsidies of up to 50% of the purchase and installation cost of aerodynamic devices, anti-idling devices, and electric trailer refrigeration units. An earlier program subsidized up to 33% of incremental capital costs of alternative fuel and anti-idling technologies.

In the near-term, retrofits that improve fuel efficiency would complement the federal truck GHG emission regulations, which already require manufacturers to produce increasingly efficient new trucks and engines. The federal government expects aerodynamic and antiidling devices will be used to meet these regulations.²⁵

THE EFFICIENCY BENEFITS OF PROVINCIAL RETROFIT SUBSIDIES ARE LIKELY TO BE TEMPORARY

Meanwhile, provincial retrofit subsidies could help truckers reduce diesel use in existing trucks in the near term, before the new technologies become standard equipment.

But the efficiency benefits of provincial retrofit subsidies are likely to be temporary. The Government of Ontario has signed onto the *Pan-Canadian Framework on Clean Growth and Climate Change*, which states, "the federal government will work with provinces, territories, and industry to develop new *requirements* for heavy-duty trucks to install fuel-saving devices like aerodynamic add-ons."²⁶ Once aerodynamic or other fuel-saving devices become mandatory federally, provincial subsidies for the same devices would not reduce diesel use.

The Ministry of Transportation assures the ECO that subsidies will be adjusted as federal programs come into effect. We appreciate this assurance but government assurances sometimes fail to result in action. For example, the government assured the ECO that an evaluation of the effectiveness of the original *Green Commercial Vehicle Program* would be completed and made public in 2014. In October 2017, the government closed the public review and comment period for the new program without releasing the evaluation of the original program. It is poor policy to expect informed public feedback of the new program without allowing the public to first understand how the last one worked.

The government should phase out diesel truck retrofit subsidies as they become redundant due to federal policies.



6.2.2 Scrapping Older Trucks

An alternative way of reducing diesel use by older trucks is to get them off the road. Some jurisdictions pay truckers to take older vehicles off the road. This would accelerate the benefits of federal regulations for new trucks by increasing fleet turnover. This is important because the federal government forecasts the turnover under Phase 2 (2018-2027) of the new truck regulations to be only 3% to 4% per year (i.e., 25- to 33-year average life).

Programs to Scrap Older Trucks

British Columbia's SCRAP-IT program includes a \$5,000 incentive to replace model year 2009 or older medium- and heavy-duty vehicles. The program includes restrictions to reduce the risk of funding vehicles that would have been scrapped regardless. The incentives accelerated vehicle recycling by 9.4 years, on average (including light-duty vehicles).²⁷

California's Carl Moyer Program encourages both retrofits and scrappage. Incentives are provided to scrap model year 2006 and older diesel mediumand heavy-duty vehicles. This is complemented by mandatory repairs for vehicles that fail air quality emission tests. The repair costs for vehicles that fail are subtracted from potential incentives to encourage pre-emptive scrappage and retrofits. The air quality benefits of the program include the prevention of an estimated 40 premature deaths annually, related to particulate matter and ozone exposure.²⁸

Programs to scrap older trucks are increasingly common around the world. These programs are important from a global perspective as the international trade of used trucks results in older, more polluting trucks being sold to developing countries.²⁹ Any resulting increase in emissions from the production of new, higher efficiency trucks would not undermine the benefits of retiring old trucks. In the overall life span of a truck, few emissions come from producing the truck itself (Figure 6.13).



Figure 6.13. Heavy-duty vehicle life-cycle GHG emissions are decreasing over time, and are almost entirely from fuel production and use. Default GHGenius results estimate average model year 2013 diesel heavy-duty vehicle production comprises only 2.6% of life-cycle GHG emissions. The International Council on Clean Transportation estimates federal regulations will result in diesel heavy-duty vehicle fuel efficiency improving by 3.5% per year on average to meet federal regulations. Actual emissions will depend on the particular vehicle.

Source: (S&T)² Consultants Inc, *GHGenius Version 4.03* (2013), Table 57d. Heavy-duty ICE Vehicles, Fossil or Nuclear Feedstocks; International Council On Clean Transportation, Assessment of Heavy-Duty Natural Gas Vehicle Emissions: Implications and Policy Recommendations, Diesel Efficiency page 14.

Provincial support for retiring older trucks would help independent owner-operators and others that otherwise lack the capital to buy new trucks.³⁰ Under the *Climate Change Action Plan*, provincial subsidies will assist lowand moderate-income Ontarians to replace older, higheremission passenger vehicles with zero-emission vehicles. The initiative could be extended to freight trucks.

Increasing fleet turnover would also provide important air quality benefits. Older trucks emit far more air pollutants, such as particulate matter, that damage human health. Because of this, the City of Toronto Board of Health has called for action to tackle emissions from older trucks.³¹

The government should fund initiatives designed to take older, less efficient diesel trucks off the road.



The third area of focus, which will be increasingly important in the long run, is to shift freight away from its current dependence on fossil fuels. Today's heavy-duty trucks are almost exclusively fuelled by diesel, a very carbon-intensive fuel with high GHG emissions.

To help reduce the reliance on *diesel* fuel, the government plans to subsidize natural gas refuelling infrastructure, renewable natural gas for transportation pilot projects, natural gas trucks and electric trucks using cap and trade proceeds. These truck subsidies are to be provided through the *Green Commercial Vehicle Program* discussed above.

The provincial government claims that *Green Commercial Vehicle Program* new truck subsidies will only be provided for alternative fuel trucks that are better than federal new truck GHG emission regulations.³² This claim wrongly assumes that *individual* trucks have GHG emission requirements. In fact, manufacturers must only reduce the *average* emissions of trucks sold in different categories (*averaging set*). SUBSIDIZING ADDITIONAL SALES OF TRUCKS WITH BELOW-AVERAGE EMISSIONS ALLOWS MANUFACTURERS TO SELL EXTRA TRUCKS WITH ABOVE-AVERAGE EMISSIONS



This subtle, but important, distinction means that subsidies for individual, low-emission trucks are not likely to reduce overall truck emissions. Subsidizing additional sales of trucks with below-average emissions allows manufacturers to sell extra trucks with above-average emissions (Figure 6.14). Should a manufacturer's fleet-average emissions fall below the federal target, they receive valuable credits that can be used in the future or sold to competitors, who again can then sell more trucks with above average emissions.³³



Manufacturer's Fleet

Figure 6.14. Federal GHG emission standards regulate a manufacturer's fleet-average GHG emissions. The regulation allows the sale of trucks with emissions above the fleet-average target, if those emissions are offset by the sale of lower emission trucks in the same category (averaging set). Fleet-average targets in the regulation are reduced over time to reduce emissions. Subsidies for particular trucks do not change the fleet-average target.

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For similar reasons, the proposed federal Clean Fuel Standard may also prevent provincial fuel switching subsidies from reducing GHG emissions in the near term. As with the truck GHG emission regulations, this standard is also proposed to include an emissions credit trading system.³⁴ If so, subsidies that encourage the sale of a lower-emission fuel will provide credits that allow the sale of a higher-emission fuel.

Thus, the interaction with federal regulations is likely to keep *Green Commercial Vehicle Program* new truck subsidies from meaningfully reducing emissions in the near term. But the subsidies for natural gas-fuelled trucking are particularly problematic.

6.3.1 Fossil Natural Gas

On the surface, subsidizing natural gas trucks appears to be justified because natural gas contains less carbon than the same amount of diesel. But carbon content is just one part of the story. Two key technological factors mean that Ontario cannot today achieve a reliable GHG benefit from trucks that use fossil natural gas.

First, current North American natural gas trucks are relatively inefficient. Natural gas is typically burned in spark-ignition engines that are less efficient than diesel compression-ignition engines, which continue to improve.³⁵ Natural gas engines must also carry the additional weight of natural gas fuel tanks, which are heavier than diesel fuel tanks. Manufacturers have had no regulatory requirement and little financial incentive to produce more fuel efficient natural gas engines/trucks for the North American market because natural gas is very cheap.³⁶ This is something that could change with time. In Europe, where natural gas prices are much higher, Volvo will be producing trucks using improved natural gas engines with efficiencies on par with diesel engines.

Second, natural gas infrastructure leaks methane, a potent GHG. Methane escapes throughout the whole life cycle of extraction, production and use including from wells, pipelines and trucks. Claims about the GHG benefit of natural gas trucking are typically based on two key assumptions: underestimating the climate damage done by methane, and/or unrealistically low methane leak rate estimates. These are discussed below.

Methane Climate Damage

As the ECO has several times reported, most official reports of methane climate damage dramatically underestimate that damage, because they use calculations of how much extra warming methane would cause over 100 years (34 times as much as carbon dioxide in the latest method of calculation). In fact, methane lasts in the atmosphere for only about 12.6 years, meaning that today's methane would be out of the atmosphere for 83.4 of the next 100 years. That is good news, except that for the 12.6 years the methane is in the atmosphere, it does about 100 times as much damage as carbon dioxide. This fact is partly recognized in what is called methane's "20-year" global warming potential: 86 times as much damage as carbon dioxide. (Figure 6.15).



Figure 6.15. 100-year global warming potentials underestimate the damage caused by methane. Increasing methane emissions will accelerate climate change in the next 20 years, the very time most critical to global efforts to control climate change.

Source: Fifth Assessment Report of the Intergovernmental Panel on Climate Change.

Federal truck GHG emissions standards, the provincial cap and trade program, and many studies underestimate the damage from methane because they use the 100-year global warming potential. It is also the default assumption used in the GHGenius and GREET computer models. See Chapter 1 for a fuller discussion of global warming potentials.

Methane Leak Rates

Although Ontario has relatively low distribution system leaks (see the ECO's 2015/2016 energy conservation report, *Let's Get Serious*), plausible estimates of overall system methane leaks are high enough to offset the GHG benefit of fossil natural gas. Life-cycle methane leak rates are uncertain, but seem likely to increase in the next few years as Ontario's gas supply becomes increasingly dependent on shale gas from the northeastern U.S. A forecast for the Ontario Energy Board estimates that 71% of Ontario's natural gas will be from the northeastern U.S. by 2021.³⁷ Shale gas is obtained by hydraulic fracking, which can result in even higher methane emissions than conventional sources.³⁸

Several peer-reviewed scientific studies have analyzed the uncertainty and variability of emissions associated with trucks fueled by U.S. natural gas.³⁹ These studies show natural gas trucks can be worse for the climate than diesel trucks:

- Columbia University and Environmental Defense Fund researchers conclude that "switching a heavy-duty truck fleet from diesel to natural gas can produce net climate damages" for 50-90 years,⁴⁰ with the results "more sensitive to the likely range of upstream [methane leak] emissions values than the likely range of [engine] efficiency loss values."⁴¹
- U.S. Department of Energy researchers (at Argonne National Laboratory, the developer of the GREET model), even with 100-year global warming potentials, estimated well-to-wheel "GHG emissions of [natural

SUBSIDIZING THE USE OF FOSSIL NATURAL GAS IS AN IMPROPER USE OF CAP AND TRADE PROCEEDS, WHICH ARE ONLY TO BE USED TO REDUCE OR SUPPORT THE REDUCTION OF GHG EMISSIONS



gas vehicles] to be slightly higher than those of the diesel counterparts given the estimated [well-to-wheel] methane leakage."⁴²

 Carnegie Mellon University researchers, also using 100-year global warming potentials, concluded that "for Class 8 tractor-trailers and refuse trucks, none of the natural gas pathways provide emissions reductions per unit of freight-distance moved compared to diesel trucks."⁴³

Issues of uncertainty and variability are not limited to U.S. natural gas. Although reported Western Canadian methane leak rates may look low compared to the U.S., Canadian leak rate estimates are likely unrealistically low, based on comparisons with air measurements of methane in Alberta⁴⁴ and B.C.⁴⁵ Uncertainty and variability can be expected considering there are over 200,000 active natural gas wells in Western Canada,⁴⁶ in addition to other natural gas infrastructure.

International Council on Clean Transportation (ICCT) researchers found natural gas trucks could reduce GHG emissions based on 20-year global warming potentials, but only if "well-to-wheel natural gas leaks [were] at or below 1 percent."⁴⁷ This condition is not true today.⁴⁸ Recent delays in Canadian and U.S. plans to cut methane leaks from oil and gas production and distribution further undercut the near-term GHG benefits of fossil natural gas trucking.⁴⁹ The ICCT researchers also concluded that "innovation will be needed in order

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for natural gas trucks to keep pace with diesel... engine efficiency improvements... although the effect is less critical than reducing methane leakage."

In summary, the ECO cannot conclude there is a reliable GHG benefit from trucking based on fossil natural gas. Therefore, subsidizing the use of fossil natural gas is an improper use of cap and trade proceeds, which are only to be used to reduce or

support the reduction of GHG emissions. Even worse, a shift towards natural gas trucking would increase methane emissions and accelerate climate change in the next 20 years, the very time most critical to global efforts to control climate change.

The government should not subsidize fossil natural gas trucking with cap and trade revenues.

Near-Zero NO, Natural Gas Engine

Natural gas trucks might not have lower GHG emissions than diesel trucks, but they do have other advantages. For example, natural gas trucks can have "near-zero" nitrogen oxide (NO_x) emissions. Although NO_x is a serious air quality pollutant, it is not a GHG. This is a critical distinction, because subsidies for natural gas trucks and refueling stations can only be funded by cap and trade proceeds if they reduce or support the reduction of GHG emissions, as discussed in Chapter 5.

Cummins Westport's "near-zero" NO_x engines also have lower methane emissions than current natural gas engines. However, even with this advanced technology, natural gas use will still result in higher life-cycle methane emissions than those from diesel use (Figure 6.16). Therefore, switching trucks from diesel to natural gas will increase methane emissions, which accelerate climate change.

If it so chooses, the government could support natural gas trucks and other vehicles for their air quality benefits. Such support could be provided from other government revenues, by repurposing fossil fuel subsidies and/or through discounts or exemptions from road pricing or other fees.



Figure 6.16. Estimated life-cycle emissions of Ontario buses using different fuels and engines. Emissions inventory from an updated version of the GHGenius model recently commissioned by natural gas engine manufacturer Cummins Westport. Compared to the most recent publicly available version (4.03a), the update estimates higher methane leaks from Canadian produced natural gas and the use of U.S. produced natural gas in Ontario.

Source: (S&T)² Consultants Inc., GHG Emissions for Ontario Natural Gas Buses (2015), Table 6-4: Individual Contaminants Comparison.

6.3.2 Renewable Natural Gas

Natural gas trucks could be a part of a low-carbon economy if they were fuelled with renewable, i.e., *green* fuel. Renewable natural gas can be produced using methane-intensive landfill gas or biogas (e.g., from manure and other agricultural waste) that would otherwise be emitted into the atmosphere, as shown in Figure 6.17. It could also be produced from excess low-carbon electricity (*power to gas*).⁵⁰



Figure 6.17. Natural gas is primarily methane, which trucks can burn and turn into carbon dioxide emissions. The impact of these emissions can be offset by the benefit of capturing sources of methane, a highly potent GHG, to produce renewable natural gas.

Landfill gas and biogas do not require cap and trade allowances. In other words, they are uncapped emissions. Subsidies that support the capture and use of these gases thus could provide an important strategic benefit, as illustrated in Figure 6.18.



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Ontario GHG Emissions

Note: Illustration is not to scale.

Figure 6.18. Subsidies for renewable natural gas sources could reduce uncapped emissions, by encouraging capped sectors to use fuel produced from captured landfill gas or agricultural biogas.

Renewable natural gas can be used interchangeably with fossil natural gas, with no limitations (unlike, for example, biodiesel in diesel engines). Fortunately, the government intends to increase the amount of renewable content in the natural gas pipeline system and the Ontario Energy Board is developing an appropriate pricing framework. Unfortunately, more renewable natural gas in the pipeline system does not do much to improve the environmental prospects of natural gas trucks in the near future.

Why? Because renewable natural gas is severely limited by potential supply – not by a lack of potential uses. The existing demand for natural gas far exceeds the potential supply of renewable natural gas (Figure 6.19). The gap between natural gas demand and renewable natural gas supply is filled by fossil natural gas.



Figure 6.19. Renewable natural gas cannot satisfy existing natural gas demand in Ontario. Fossil natural gas must be used to fill this gap. Increasing natural gas demand will therefore increase fossil natural gas use.

Source: S. Abboud and B. Scorfield, Potential of Renewable Natural Gas from Ontario Wastes (2011) at Figure 7.

CONNECTING TRUCKS TO THE NATURAL GAS PIPELINE SYSTEM DIGS A DEEPER HOLE THAT RENEWABLE NATURAL GAS CANNOT REALISTICALLY FILL

Increasing demand on the natural gas pipeline system – to fuel trucks or anything else – therefore increases fossil natural gas use. The only exception would be fuelling trucks directly from renewable natural gas projects that do not have a pipeline connection and, therefore, cannot be used to meet existing natural gas demand. For example, garbage trucks fuelled with renewable natural gas produced at landfills without pipeline connections can use methane that would otherwise be released.⁵¹ These could potentially be supported by the *Climate Change Action Plan* initiative to "pilot waste and agricultural methane as a fuel source."

The first step to getting out of a hole is to stop digging. Connecting trucks to the natural gas pipeline system digs a deeper hole that renewable natural gas cannot realistically fill. These trucks thus would not provide a future pathway to a low-emission future, but rather an anchor to our high-emission present.

The government should support only those renewable natural gas trucking projects that do not have a pipeline connection.

6.3.3 Electricity

Battery electric trucks are not yet practical for longdistance hauling – although they are improving rapidly. In the near term, short-distance electric trucks for local freight delivery or garbage collection are more feasible. These trucks have shorter driving distance requirements so can use smaller and less expensive batteries.

There is encouraging news that electric trucking is coming sooner than many think:

- In November 2017, Tesla announced that its fully electric semi-truck, with a driving range of up to 800 km, will begin production in 2019. Loblaws, Walmart Canada, Toronto-based Fortigo Freight, and Hercules Freight (a cross-border shipper) have all pre-ordered Tesla electric semi-trucks.
- Also in November 2017, BYD, the world's largest manufacturer of electric vehicles, announced plans to manufacture electric delivery and garbage trucks in Ontario. Loblaws has already purchased its first fully electric semi-truck with a 150 km driving range from BYD.

ELECTRIC TRUCKING IS COMING SOONER THAN MANY THINK

Although battery electric truck technologies are rapidly developing, the International Council on Clean Transportation notes that the ability for zero-emission trucks to reduce emissions will be limited by the slow turnover of the truck fleet.⁵² Thus active steps should be taken to remove older trucks off the road.



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Explicit support for electric trucks in the *Climate Change Action Plan* is currently limited to subsidies for new trucks. Other types of support, including support for standardizing charging infrastructure, should also be considered.

Urban consolidation centers could help introduce electric trucks to the industry. These facilities allow loads from different shippers to be consolidated near a congested urban area. The consolidated loads could then use fewer and/or smaller trucks to make deliveries in the congested area. This system also creates more opportunities for trucks with shorter driving ranges that would only be required to travel to and from the consolidation center. Electric trucks would be more competitive in this environment. The key barrier for urban consolidation centers has been high costs and reliance on temporary subsidies.⁵³

The Bristol-Bath urban freight consolidation center in the United Kingdom is serviced by electric trucks.⁵⁴ The number of truck deliveries made to participating retailers decreased by 76% during the initial pilot project from January 2011 to April 2012. Nitrogen oxide concentration in the air also decreased, despite only 20 retail outlets participating.

Freight deliveries do not have to be limited to trucks. Bicycles and cargo tricycles are already being used for courier services and food deliveries in Ontario cities. UPS recently announced a cargo tricycle with a 400 kg capacity will begin testing around the York University campus area, which is near a distribution center. An electric motor would allow the tricycle to travel farther and with more cargo. Unfortunately, the provincial government currently prohibits electric cargo bicycles/tricycles above 120 kg weight limit. This limit should be reconsidered.



Photo Credit: Dianne Saxe, Environmental Commissioner of Ontario.

6.3.4 Hydrogen

Hydrogen fuel cells are arguably more compatible with long-distance trucks than batteries. While both are currently expensive, batteries are heavy and can be slow to charge. Ontario-based Hydrogenics is capitalizing on the opportunity hydrogen presents:

- They are developing a Markham demonstration project with Enbridge to generate hydrogen from electricity when there is excess wind power.
 (Hydrogen is more typically produced from fossil fuels.)
- The federal government has selected the company to build two hydrogen fueling stations in the Greater Toronto Area. (The lack of refueling stations is a critical limitation for hydrogen fuel cell trucks.)

 Hydrogenics is also supplying fuel cells for use in a Norwegian grocery wholesaler's trucks. (Trucks that can return to a centralized location for refueling do not require a large network of refueling stations.)

Nikola Motor Company is also working to develop a market for hydrogen fuel cell semi-trucks. The company is developing trucks, solar projects to produce hydrogen, and hydrogen fuelling stations. Their Ontario hydrogen fuelling stations are tentatively planned for both Toronto and Nipigon.

Explicit support for fuel cell trucks in the *Climate Change Action Plan* is currently limited to research. As with electric trucks, hydrogen fuel cell trucks may need and deserve other forms of support.

HYDROGEN FUEL CELLS ARE ARGUABLY MORE COMPATIBLE WITH LONG-DISTANCE TRUCKS THAN BATTERIES



GO Transit

The provincial government, via Metrolinx, is electrifying some GO Transit service as part of the Regional Express Rail project. Currently, diesel locomotives pull long trains of passenger railcars. The busiest parts of the GO Transit system are to switch to shorter self-propelled electric trains to allow for more frequent service. At this point, it is undecided where the electricity will come from.

The original plan was to use catenary wires. These are overhead wires that can be seen powering Toronto's streetcars and Ottawa's light-rail transit. (Catenary wires are also being used with freight trucks in pilot tests in California and Sweden on highways with high concentrations of short-distance truck traffic). Wiring avoids the cost, weight and charging time of large batteries.

One of the challenges with installing wiring is that some of the track used by GO Transit is owned and used by freight train companies. Metrolinx is now investigating the use of hydrogen fuel cells to generate electricity instead. Hydrogen fuel tanks could be refueled at central locations. Fuel cells would then use hydrogen to generate the electricity needed onboard. Hydrogen fuel cell trains (*hydrail*) would be a high profile way to introduce Ontarians to this new technology.

Either way, zero emission trains are a step in the right direction.
6.4 Conclusions and Recommendations

The growth of trucking GHG emissions is on track to prevent Ontario from achieving its emissions-reduction targets. The provincial government's efforts to make room for more fossil fuel vehicles on the road will reinforce this dangerous trend. It is critical that the government implement policies that help *avoid* trucking where possible, *improve* diesel truck efficiency and *shift* freight away from fossil fuels.

Avoid: Road pricing is a powerful tool that can help avoid truck driving where possible, particularly during the busiest times and in the busiest areas. Road pricing could also provide funding for complementary traffic-reducing investments, including funding offpeak delivery programs and public transit, at both the provincial and municipal levels.

The government should prioritize road pricing and complementary investments to reduce traffic, instead of new highway construction, which increases traffic.

The government should allow municipalities to charge for the use of their roads.

Improve: Removing old trucks from the road can help improve the efficiency of the diesel truck fleet – and accelerate the shift away from fossil fuels. Scrappage programs would complement federal new truck GHG emission regulations by increasing fleet turnover rate, which the federal government forecasts will otherwise be just 3% to 4% annually. Scrappage programs also avoid duplicating planned federal retrofit requirements. Fossil fuel truck efficiency improvements are sufficient to meet federal truck GHG emission regulations, which will increase in stringency until 2027. However, such improvements are unlikely to be sufficient for Ontario to meet its 2030 and 2050 emissions-reduction targets. Zero emission trucks are almost certainly needed.

The government should phase out diesel truck retrofit subsidies as they become redundant due to federal policies.

The government should fund initiatives designed to take older, less efficient diesel trucks off the road.

Shift: Subsidizing a shift from diesel to fossil natural gas trucks will not reduce GHG emissions. Provincial subsidies to connect trucks to the natural gas pipeline system could actually *accelerate* climate change. Support for off-grid renewable natural gas projects and zero emission trucks have more promise. The trucking industry is understandably cautious about adopting new – let alone radically different, transformative – technologies. Research and other support for electric and hydrogen trucking and even cargo bicycles could assist with this transition. Otherwise, cap and trade program allowance prices may eventually have to skyrocket to force the trucking industry to change.

The government should not subsidize fossil natural gas trucking with cap and trade revenues.

The government should support only those renewable natural gas trucking projects that do not have a pipeline connection.



- 1. Metrolinx, *GTHA Urban Freight Study: Technical Backgrounder* by HDR | iTRANS (Toronto: Metrolinx, 2011) *at 166.*
- International Council for Clean Transportation, Barriers to the Increased Adoption of Fuel Efficiency Technologies in the North American On-Road Freight Sector by North American Council for Freight Efficiency and Cascade Sierra Solutions, (San Francisco: ICCT, 2013) at 43.
- The Economist, *The appy trucker*, The Economist (March 3, 2016) online: <<u>www.economist.com/news/business/21693946-digital-help-hand-</u> fragmented-and-often-inefficient-industry-appy-trucker>
- J A Dyer, R L Desjardins, Y Karimi-Zindashty, B G McConkey, "Comparing fossil CO₂ emissions from vegetable greenhouses in Canada with CO₂ emissions from importing vegetables from the southern USA" (2011) 15:4 Energy for Sustainable Development 451 (ScienceDirect) at 451.
- 5. Environmental Commissioner of Ontario, *Beyond the Blue Box,* Special Report (Toronto: ECO 2017).
- "Metrolinx, Costs of Congestion in the Greater Toronto and Hamilton Area: Impact and Cost Benefit Analysis of the Metrolinx Draft Regional Transportation Plan by HDR, (Toronto: Metrolinx, 2008) at 2.
- Toronto Region Board of Trade, Report #3: Toronto-Waterloo Corridor Movement of Goods Business & Consumer Impacts, (Toronto: BOT, 2017) at 3.
- 8. Pembina Institute, *Local Planning for Goods Movement in Ontario* by Lindsay Wiginton (Calgary: Pembina Foundation, 2017) at 22.
- G Duranton, M A Turner, "The Fundamental Law of Road Congestion: Evidence from US Cities" (2011) 101:6 American Economic Review 2616 at 2616.
- K M Nurul Habib, N Day, E J Miller "An investigation of commuting trip timing and mode choice in the Greater Toronto Area: Application of a joint discrete-continuous model" (2009) 43:7 Transportation Research Part A: Policy and Practice 639 (ScienceDirect) at 639.
- California Air Resources Board, Impact of Highway Capacity and Induced Travel on Passenger Vehicle Use and Greenhouse Gas Emissions by Susan Handy and Marlon Boarnet (Sacramento: CARB, 2014) at 2.
- F Kellner "Exploring the impact of traffic congestion on CO₂ emissions in freight distribution networks" (2016) 9:21 Logistics Research 1 (Springer Link) at 13.
- A Aboudina, H Abdelgawad, B Abdulhai, K Nural Habib "Timedependent congestion pricing system for large networks: Integrating departure time choice, dynamic traffic assignment and regional travel surveys in the Greater Toronto Area" (2016) 94 Transportation Research Part A 411 (ScienceDirect) at 411.
- 14. Pembina Institute, *Fare Driving* by Lorie Srivastava and Cherise Burda (Calgary: Pembina Institute, 2015) at 2.
- Canada's Ecofiscal Commission, We Can't Get There From Here: Why Pricing Traffic Congestion is Critical to Beating It (Sherbrooke: Ecofiscal, 2015) at 23.

- J Holguin-Veras, Q Wang, N Xu, K Ozbay, M Cetin, J Polimeni "The impacts of time of day pricing on the behavior of freight carriers in a congested urban area: Implications to road pricing" (2006) 40:9 Transportation Research Part A: Policy and Practice 744 (ScienceDirect) at 765.
- J Holguin-Veras, "The truth, the myths and the possible in freight road pricing in congested urban areas" (2010) 2:3 Procedia – Social and Behavior Sciences 6366 (ScienceDirect) at 6376.
- International Energy Agency, The Future of Trucks Implications for Energy and the Environment, (Paris: IEA, 2017) at 24.
- 19. Department for Transport, *Freight Carbon Review*, (London: Crown, 2017) at 18.
- R B Ellison, S P Greaves, D A Hensher, "Five years of London's low emission zone: Effects on vehicle fleet composition and air quality" (2013) 23:August 2013 Transportation Research Part D: Transport and Environment 25 (ScienceDirect) at 25.
- "London's congestion charge," online: Center for Public Impact <<u>www.</u> centreforpublicimpact.org/case-study/demand-management-for-roadsin-london/> [Published: April 15, 2016]
- Andrea Broaddus, Michael Browne, Julian Allen, "Sustainable Freight: Impacts of the London Congestion Charge and Low Emissions Zone" (2015) 2478 Transportation Research Record at 1.
- 23. Ministry of Transportation, information provided to the ECO (November 10, 2017).
- "Regulations Amending the Heavy-duty Vehicle and Engine Greenhouse Gas Emission Regulations and Other Regulations Made Under the Canadian Environmental Protection Act," online: Canada Gazette <<u>www.gazette.gc.ca/rp-pr/p1/2017/2017-03-04/html/reg1-eng.php></u> [Published: March 4, 2017]
- Regulations Amending the Heavy-duty Vehicle and Engine Greenhouse Gas Emission Regulations and Other Regulations Made Under the Canadian Environmental Protection Act," online: Canada Gazette <<u>www.gazette.gc.ca/rp-pr/p1/2017/2017-03-04/html/reg1-eng.php></u> [Published: March 4, 2017]
- 26. Government of Canada, Pan-Canadian Framework on Clean Growth and Climate Change, (Ottawa: 2016) at 18.
- 27. W Antweiler, S Gulati, *An Analysis of British Columbia's SCRAP-IT Program: Emissions Savings, Participation, and Transportation Choice,* (Richmond: BC SCRAP-IT Program Society, 2014) at 1.
- "Joint ARB & CAPCOA AB 8 Carl Moyer Program Evaluation," online: California Air Resources Board <<u>https://www.arb.ca.gov/board/</u> books/2014/121814/14-10-6pres.pdf> [Published: December 18, 2014]
- 29. Global Fuel Economy Initiative, *Targeting Heavy Duty Vehicle Fuel Economy* (London: GFEI) at 3.
- International Council for Clean Transportation, Barriers to the Increased Adoption of Fuel Efficiency Technologies in the North American On-Road Freight Sector by North American Council for Freight Efficiency and Cascade Sierra Solutions, (San Francisco: ICCT, 2013) at 6.



- 31. "Reducing Health Risks from Traffic-Related Air Pollution (TRAP) in Toronto," online: City of Toronto <app.toronto.ca/tmmis/ viewAgendaltemHistory.do?item=2017.HL22.3> [Published: October 30, 2017].
- 32. Ontario Ministry of Transportation, information provided to the ECO in response to ECO inquiry (July 17, 2017).
- 33. Heavy-duty Vehicle and Engine Greenhouse Gas Emission Regulations, SOR/2013-24.
- 34. Environment and Climate Change Canada, Clean Fuel Standard: Discussion Paper (Ottawa: ECCC, 2017) at 1.
- 35. International Council for Clean Transportation, Assessment of Heavy-Duty Natural Gas Vehicle Emissions: Implications and Policy Recommendations (San Francisco: ICCT, 2015) at v.
- 36. National Petroleum Council, Advancing Technology for America's Transportation, (Washington: NPC, 2012) at 3-12 to 3-14.
- Ontario Energy Board, 2015 Natural Gas Market Review by Navigant 37 (Toronto: OEB, 2015) at 2.
- 38. Argonne National Laboratory, Updated Fugitive Greenhouse Gas Emissions for Natural Gas Pathways in the GREET1_2016 Model (Argonne: ANL, 2016) at 7.
- 39. Sources of uncertainty include accidental methane leaks and the efficiency of trucks in real world (as opposed to laboratory) conditions. Sources of variability include differences in methane leaks among numerous wells and differences in performance among different truck engines.
- 40. Jonathan R Camuzeaux, Ramón A Alvarez, Susanne A. Brooks, Joshua B. Browne, Thomas Sterner, "Influence of Methane Emissions and Vehicle Efficiency on the Climate Implications of Heavy-Duty Natural Gas Trucks" (2015) 49:11 Environmental Science & Technology 6402 at 6402.
- 41 Jonathan B Camuzeaux, Ramón A Alvarez, Susanne A, Brooks, Joshua B. Browne, Thomas Sterner, "Influence of Methane Emissions and Vehicle Efficiency on the Climate Implications of Heavy-Duty Natural Gas Trucks" (2015) 49:11 Environmental Science & Technology 6402 at 6406.
- 42. Hao Cai, Andrew Burnham, Rui Chen, Michael Wang, "Wells to wheels: Environmental implications of natural gas as a transportation fuel" (2017) 109 Environmental Science & Technology 565 at 565.
- 43. Fan Tong, Paulina Jaramillo, and Inês M L Azevedo, "Comparison of Life Cycle Greenhouse Gases from Natural Gas Pathways for Medium and Heavy-Duty Vehicles" (2015) 49:12 Environmental Science & Technology 7123 at 7123.
- 44. Matthew R. Johnson, David R. Tyner, Stephen Conley, Stefan Schwietzke, Daniel Zavala-Araiza, "Comparisons of Airborne Measurements and Inventory Estimates of Methane Emissions in the Alberta Upstream Oil and Gas Sector" (2017) 15:21 Environmental Science & Technology 13008 at 13008.
- 45. Emmaline Atherton, David Risk, Chelsea Fougère, Martin Lavoie, Alex Marshall, John Werring, James P. Williams, Christina Minions, "Mobile measurement of methane emissions from natural gas developments in northeastern British Columbia, Canada" (2017) 17 Atmos. Chem. Phys. 12405 at 12405.

- 46. "Market Snapshot: Fewer wells account for majority of natural gas production in western Canada," online: National Energy Board <www. neb-one.gc.ca/nrg/ntgrtd/mrkt/snpsht/2016/01-03fwrwll-eng.html> [Published: January 21, 2016].
- 47. International Council for Clean Transportation, Assessment of Heavy-Duty Natural Gas Vehicle Emissions: Implications and Policy Recommendations (San Francisco: ICCT, 2015) at v.
- 48. Estimated leak of 1.2% based on reported and estimated methane emissions, which may be low when compared to measurements of methane measurements in the air.

(S&T)² Consultants Inc., GHG Emissions for Ontario Natural Gas Buses (2015), Figure 6-1.

- 49. Margo McDiarmid, Federal government seeks to push back methane reduction regulations by up to 3 years", CBC News (April 20, 2017), online: <www.cbc.ca/news/politics/methane-emissions-regulationschanges-1.4078468>.
- 50. Although methanation of hydrogen (discussed below) could theoretically produce more renewable natural gas, it is unclear if this will become viable at a large scale or if it is environmentally wise to convert a useful fuel (hydrogen) into a highly potent GHG emission (methane).
- 51. "CNG Fueling Projects", online: BioCNG < biocng.us/projects/cng-fuelprojects/> [Accessed: November 29, 2017].
- 52. International Council on Clean Transportation, Transitioning to zeroemission heavy-duty freight vehicles by Marissa Moultak, Nic Lutsey and Dale Hall (San Francisco: ICCT, 2017) at 6.
- 53. H Johansson, M Björklund, "Urban consolidation centres: retail stores demand for UCC services" (2017) 47:7.
- 54. International Journal of Physical Distribution & Logistics Management 646 at 648.
- 55. "Urban Freight Consolidation", online: CIVITAS < civitas.eu/content/ urban-freight-consolidation> [Accessed November 30, 2017]

Chapter 7 Taking Climate Change Seriously Across Government

Is the government getting serious about climate change? Yes – but there is still a long way to go

Abstract

Is the Government of Ontario taking climate change seriously? The public will not take the issue seriously unless the government does. In all government action, climate change needs to be treated like the crisis it is.

To assess climate change action across government, the ECO sent a questionnaire to 17 government ministries and one agency. Overall, the responses reveal that ministries are starting to take climate change seriously in some respects. The 2016 *Climate Change Action Plan*, the competition for cap and trade proceeds, and climate science presentations by the ECO are all having a positive impact. Nevertheless, the government greatly underestimates its own emissions and overlooks climate change considerations in a number of ministry initiatives that have climate change implications.

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7.0 Awareness of Climate Change is Improving

By adopting the *Climate Change Mitigation and Low-carbon Economy Act, 2016* (the "*Climate Act*"), the Ontario government has committed itself to an unprecedented transformation of our economy. This necessary but difficult transformation will require active commitment by all parts of society, including governments. Addressing climate change was declared a government-wide priority in the 2016 mandate letters sent by the Premier to each minister. In keeping with this priority, the 2016 *Climate Change Action Plan* includes commitments for government-wide improvements, such as the commitment to make government operations carbon neutral by 2018, and to ensure low-carbon procurement.

Following the publication of the Environmental Commissioner of Ontario's (ECO's) 2016 *Greenhouse Gas Progress Report: Facing Climate Change,* the Environmental Commissioner met with senior management of key government ministries, as well as all three caucuses, other Legislative Officers, and appropriate boards and commissions, to impress upon

THE ONTARIO GOVERNMENT HAS COMMITTED ITSELF TO AN UNPRECEDENTED TRANSFORMATION OF OUR ECONOMY

them the urgency of climate change. Government staff seemed sobered by how much climate change is already occurring and the powerful effects it is having, and will have, in Ontario and elsewhere. The impact of the *Climate Act* on constituent groups, and the prospect of accessing cap and trade proceeds, have also elicited strong attention across government.

But other than the Ministry of the Environment and Climate Change (MOECC), are other ministries serious about climate change, either in terms of greenhouse gas (GHG) mitigation or adaptation? What, if anything, have ministries done to put a climate lens on their activities?

7.1 Climate Lens Questionnaire

To answer these questions, the ECO sent a questionnaire (see Table 7.1) to 17 government ministries and one agency. All ministries provided a response (see Table 7.2).¹

Table 7.1. Questions Asked

Question

- 1. What is the most important threat that climate change poses to your ministry's mandate?
- 2. What is the most important opportunity that climate change creates for your ministry's mandate?
- Does your ministry intend to address climate change (mitigation and/or adaptation) in the ministry's Statement of Environmental Values? If so, when?
- 4. Does your ministry routinely identify and evaluate climate change issues in briefing notes?
- 5. Does your ministry routinely identify and evaluate climate change issues in Cabinet submissions?
- 6. What, if any, is your ministry's procedure for taking climate change into account when making procurement decisions? Please provide links to the relevant documents.
- What, if any, is your ministry's procedure for taking climate change into account when making regulatory decisions? Is climate change included in regulatory impact statements? Please provide links to the relevant documents.

- 8. What, if any, is your ministry's procedure for taking climate change into account when making decisions about grants and loans? Please provide links to the relevant documents.
- 9. Does your ministry calculate its Scope 1, Scope 2 and/or Scope 3 GHG emissions? If so, what are your emissions?
- Does your ministry publicly disclose its Scope
 1, Scope 2 and/or Scope 3 GHG emissions?
 If so, how? Please provide links to the relevant documents.
- 11. For the purposes described in questions 4 through 10, does your ministry quantify, in financial terms, the impacts of GHG emissions? If so,a. what figure does your ministry use; andb. what method does your ministry use to calculate it?
- 12. How have your ministry's GHG emissions changed over the past year? Why?
- 13. Does your ministry provide information about climate change to your client groups? Please provide links to the relevant documents.

Table 7.2. Ministries that Received a Questionnaire

Ministries

Agriculture, Food and Rural Affairs Economic Development and Growth Education Energy Environment and Climate Change Finance Government and Consumer Services Health and Long-Term Care Indigenous Relations and Reconciliation Infrastructure Labour **Municipal Affairs** Natural Resources and Forestry Northern Development and Mines Tourism, Culture and Sport Transportation Treasury Board Secretariat

7.1.1 Perceived Climate Change Threats and Opportunities

In our first two questions, we wanted to assess each ministry's awareness of the impacts of climate change on their respective mandates.

The ministries were asked to list the most important threat that climate change poses. The responses turned out to be quite comprehensive, as ministries identified multiple threats. Direct damages identified included:

- environmental damage, such as damage to ecological systems;
- damage to natural resources, such as clean water and forests;
- damage to capital resources, including public infrastructure and private property;
- damage to cultural resources i.e., heritage sites;
- damage to economic supply chains;
- damage to human health and safety e.g., increased prevalence of Lyme disease; and
- damage to food production systems.

Indirect economic costs from climate change were also mentioned, and include:

- the increased cost of managing financial and liability risks, such as those from extreme weather events;
- GHG mitigation costs, such as the increased cost of procuring low-carbon goods;
- climate change adaptation costs;
- costs associated with the potential risk of decreased economic competitiveness – e.g., businesses taking advantage of less stringent regulatory environments in other jurisdictions; and

• diminished economic growth.

Two ministries (Education and Government and Consumer Services) did not identify any specific significant threat to their respective mandates even though Education, for example, faces challenges posed by overheating in schools and portable classrooms.

The climate change opportunities mentioned by the ministries tended to focus on potential economic benefits. Perhaps the most significant direct opportunity listed by the ministries was the potential increase in the productive capacity of northern Ontario farmland. The other key opportunities addressed the role of climate change as a driver for new markets, investments, and technology development. A number of ministries alluded to the potential economic benefits from efforts to reduce emissions and adapt to the changing climate. Examples included economic benefits from:

- the growth of the green economy and the clean technology sector;
- increased investment in the construction of infrastructure that is more resilient to rising temperatures and extreme weather events; and
- increased investment in low-carbon technologies, which may have the added benefits of improving production efficiency and business competitiveness.

Other opportunities mentioned were administrative, and included the introduction of new policies and programs, as well as revisions to regulations, standards, procurement policies and taxes.

Overall, most ministries recognized numerous effects (threats and opportunities) of climate change on their respective mandates. MOST MINISTRIES RECOGNIZED NUMEROUS EFFECTS (THREATS AND OPPORTUNITIES) OF CLIMATE CHANGE

7.1.2 Ministry Statements of Environmental Values

Each ministry prescribed under the *Environmental Bill of Rights, 1993 (EBR)* is required to develop a Statement of Environmental Values (SEV) which "is the framework used by the ministry when it makes decisions that may affect the environment."² Our third question addressed whether they intend to incorporate climate change mitigation and/or adaptation issues within their SEVs, and when they intend to do so. Out of all the questionnaire recipients, it is only the Ministry of Finance that is not legally obligated to have an SEV.³

At the time of writing, only the SEVs of the Treasury Board Secretariat and the Ministry of Economic Development and Growth included a section which addresses climate change. All but four (Education; Energy; Tourism, Culture and Sport; and the Treasury Board Secretariat) of the ministries prescribed under the EBR are in the process of revising their SEVs, with most intending to address climate change. It is a good sign that all proposed updates to ministerial SEVs posted on the Environmental Registry in 2017 recognize the need to mitigate climate change and adapt to an already changing climate. Nevertheless, the wording remains too vague. The SEVs should explain how ministries will identify opportunities to reduce GHG emissions and/ or enhance Ontario's resilience to changing climate patterns. Ministries should also commit their best efforts towards incorporating those opportunities into their policies, laws and regulations. The ECO has provided ministries with explicit advice on SEV revisions.

7.1.3 Climate Change Information Flow and Analysis

How do the ministries share information about climate change internally and with their stakeholders? Three of the ECO's questions pertained to this issue addressing briefing notes, Cabinet submissions, and the communication of climate change information to various client groups. Ministries use internal briefing notes to convey information, including complex information, in a concise manner. Briefing notes and Cabinet submissions are the key internal tools to inform decision makers about the various issues for which they are accountable. Although the stipulation to consider climate change is included in some ministerial mandate letters, SEVs and the Climate Change Action Plan, the everyday decisions of ministries are informed by briefing notes and Cabinet submissions. It is important for these key documents to include climate change impact considerations.

In the responses we received, the ministries claimed that they take climate change into account wherever appropriate, and sometimes supplied examples in which this was the case. Unfortunately, the responses were insufficiently detailed to produce an adequate assessment of the overall performance of the ministries. The ministries seem to decide *ad hoc* when to include climate change considerations in briefing notes, Cabinet submissions and communications with client groups.

MINISTRIES SEEM TO DECIDE *AD HOC* WHEN TO INCLUDE CLIMATE CHANGE CONSIDERATIONS IN COMMUNICATIONS

7.1.4 Decisions on Procurement, Grants, and Loans

How do the ministries take climate change mitigation and adaptation concerns into account in their decisions on procurement, grants and loans? The 2016 *Climate Change Action Plan* provided clear directions, such as ensuring low-carbon procurement, moving toward a carbon neutral public service, and setting tax and regulatory policies that encourage low-carbon innovations.

Ministry responses to the ECO's question on procurement were almost identical, claiming that the Government of Ontario is working on making climate change a mandatory consideration in procurement decisions. The ministries stated that (1) climate change mitigation and adaptation concerns are already mandated for major public infrastructure projects, and (2) the current Ontario Public Service procurement directive includes a section on the environmental considerations to take into account in procurement decision making. The ECO is very pleased to see that the 2017 Long-Term Infrastructure Plan includes commitments to use life-cycle assessment and a social cost of carbon in infrastructure planning and decisions.⁴ The Low-Carbon Procurement chapter of this report provides further detail on the procurement issue.

The responses to the ECO's question on grants and loans focused on those programs in which environmental objectives are inherently prominent (e.g., support for the clean technology sector). Ministries noted how these grants and loans help finance projects, programs and activities that could help reduce GHG emissions relative to a baseline. But much larger grant and loan programs may cause an increase in GHGs; on this issue, ministries were silent. For example, the government's \$100 million Natural Gas Grant Program supports the building of new natural gas infrastructure.⁵ Depending on which energy sources are displaced, this program might increase GHG emissions.

A further concern is the apparent ignoring of environmental costs when evaluating grants and loans. For example, the Ministry of Economic Development and Growth informed the ECO that applications to the Eastern Ontario Development Fund, the Southwestern Ontario Development Fund and the Jobs and Prosperity Fund are assessed using a scorecard approach which considers environmental benefits (including GHG reductions), but not potential environmental costs.

Unfortunately, some ministries continue programs that are clearly counter-productive in terms of climate change. For example, the government has not eliminated the subsidies (tax concessions) related to gasoline, diesel fuel or other fossil fuels. In 2015, these amounted to \$625 million.⁶

UNFORTUNATELY, SOME MINISTRIES CONTINUE PROGRAMS THAT ARE CLEARLY COUNTER-PRODUCTIVE IN TERMS OF CLIMATE CHANGE

7.1.5 Regulations

Most ministries that have regulatory functions say they have started to consider climate change in their regulatory systems. In their responses, the ministries claimed to incorporate climate change considerations in regulatory decisions where appropriate, and often request advice from the MOECC on how to do so.

Under the *EBR*, prescribed ministries are required to consult the public via the Environmental Registry when proposing environmentally significant regulations. Ministries might give more weight to climate change mitigation and adaptation if the public raises these issues when commenting on proposed regulations. Such comments would be more likely, and better informed, if all regulatory proposals were accompanied by regulatory impact statements that include an analysis of the impact of the proposed regulation on (1) Ontario's GHG emissions and (2) adapting and preparing Ontario for a changed climate.

Considering Climate Change in Project Approvals

The Ministry of the Environment and Climate Change (MOECC) has issued two project approvals which include conditions relating to climate change. In approving the Côté Gold Project and Rainy River Gold Mine, MOECC is requiring the mine proponents to show that their projects are capable of adapting to climate change during all phases of the project life cycle, from project planning to closure. This will require, among other things, consideration of the 500-year flood level and other extreme weather events.⁷ This is an encouraging example of a ministry applying a climate change lens at the project level.

Using a Social Cost of Carbon to Account for Climate Impacts of a Regulation

One typical and important feature of a regulatory impact statement is a cost-benefit analysis. Should climate change damage be represented by a monetary valuation in such an analysis? Choosing an appropriate amount is challenging, but any specific dollar amount has some weight and can drive change. On the one hand, we know that climate damage is and will be greater than zero, both inside and outside Ontario, so any number is arguably better than no number (which is equivalent to zero). On the other hand, estimates of future climate damage are necessarily imprecise. There are many methodological issues which contribute to the uncertainty of a damage estimate, such as choosing the time horizon used to evaluate future climate damage and the discount rate to apply to such future damage. Most importantly, the calculation and the resulting dollar amount has to somehow integrate not only expected economic damage, but also impacts like species extinctions and ecosystem disruptions. This would require countless non-market value judgments, which cannot be objective.

The Canadian federal government, and the U.S. government under former President Obama, have used a social cost of carbon (SCC) in regulatory impact analysis as an estimate of the cost of climate damage, calculated using a set of integrated models. In 2016, the Canadian government used the figure of \$41/t CO_2 eq.⁸

Ontario has at least four options to use an SCC to evaluate proposed regulations:

- 1. Use the same SCC number that the federal government uses;
- 2. Use the price of carbon established in the GHG allowance auctions, perhaps the most recent auction;
- 3. Use the floor price in a GHG allowance auction, perhaps the most recent auction; or
- 4. Develop a new estimate, which might be a very difficult task.

Alternatively, the government may choose to report only expected GHG emission changes, and attempt no damage valuation at all.

The ECO recommends that, where proposed regulations may have significant impacts on Ontario-wide GHG emissions (e.g., >10,000 t CO_2e/yr), all ministries should post regulatory impact statements on the Environmental Registry showing a cost-benefit analysis that includes a social cost of carbon, estimated consistently across ministries.

7.1.6 GHG Reporting

With approximately 65,000 employees, the GHG emissions of the Ontario Public Service (OPS) are substantial. The billions of dollars of goods, services, and constructed assets purchased by the Ontario government each year are almost certainly responsible for millions of tonnes of GHG emissions each year (see Low-Carbon Procurement Chapter). In addition, the government powerfully influences GHG emissions elsewhere in the economy through its funding, tax, regulatory, land use and other policies.

When governments report their GHG emissions, they are expected to categorize them into Scope 1, 2 and 3 emissions, following internationally agreed reporting practices (Figure 7.1).⁹

- Scope 1 emissions are under the direct control of a reporting organization. An Ontario example would include emissions from the combustion of fuel used in government-owned buildings and vehicles.
- Scope 2 emissions are upstream indirect emissions associated with producing the energy consumed by the organization.
- Scope 3 emissions are the remaining indirect emissions caused by the activities of the organization, such as employee-related business travel, employee commuting, the production and distribution of procured products, and contracted solid waste management services.





Source: World Resources Institute, online: http://www.wri.org/resources/charts-graphs/operational-boundaries-ghg-emissions [Accessed January 8, 2018]

Four questions to the ministries (9-12) were about their GHG reporting. The responses we received were almost identical. They indicated that GHG emissions are reported not by ministry, but enterprise-wide (encompassing all of the OPS) in its annual *Energy Consumption and Greenhouse Gas Emission Report*. The GHG emissions of individual ministries are not made public.

The government estimates that the OPS GHG footprint is almost 200 kt of CO_2e (0.1% of Ontario's total 2015 emissions of 166 Mt). This estimate, illustrated in Figure 7.2, consists of direct emissions from the combustion of fossil fuels in OPS-owned buildings, OPS-owned and -leased vehicles, and business-related air travel by OPS employees, plus the upstream emissions associated with the production and distribution of electricity that the OPS uses in its buildings.



Total: 195.4 kt CO₂e

Figure 7.2. Estimated GHG emissions from energy used by the Ontario Public Service in 2015. Chart produced using 2015 data from the OPS Green Office (2017).

THIS GREATLY UNDERESTIMATES THE GOVERNMENT'S FULL FOOTPRINT

In other words, the government's estimate includes most Scope 1 and Scope 2 emissions,¹⁰ and a small fraction of Scope 3 emissions (employee air travel). However, this greatly underestimates the government's full footprint and does not comply with the *GHG Protocol Corporate Value Chain (Scope 3) Accounting and Reporting Standard*, an internationally agreed-upon reporting approach. In particular, the following required Scope 3 emissions are missing:¹¹

- Embodied emissions of procured products (including upstream emissions from production, transportation and installation; and downstream emissions from disassembly, recycling and/or disposal);
- Emissions from leased OPS building spaces (the Ontario government leases an estimated 15-20% of its total occupied floor space, with the remaining space located in government-owned buildings);¹²
- Emissions associated with employee travel by non-air modes (i.e., taxis, buses, trains and car rentals) for business purposes, using transport vehicles owned outside of the OPS;
- Upstream emissions associated with internet use and server storage (where the servers are not owned/ administered by the government); and
- 5. Emissions associated with employee commuting.

The ECO recognizes the difficulties in collecting all of the data necessary to estimate the missing emissions. Scope 2 and 3 emissions are, by definition, not under the direct control of the OPS, and the methods to estimate Scope 3 emissions are still under development.¹³ Nevertheless, a general estimate of the missing emissions is feasible.

7.2 Estimating the Government's Full GHG Footprint

As indicated, the OPS tracks most of its Scope 1 and Scope 2 emissions, but almost none of its Scope 3 emissions. How many emissions are excluded? The ECO put together an estimate of OPS Scope 1, 2 and 3 emissions, using a 2014 baseline. This estimate includes verified government figures (GHG emissions from OPS energy use), as well as modelled estimates based on government procurement spending and other model inputs (for a detailed description of the calculation methods used and the uncertainty associated with the estimates see Appendix E, available online only at eco.on.ca). The resulting estimate - a little over a half million tonnes - tells us that the current method used to depict the GHG footprint of the government considerably underestimates the size of its actual footprint (Figure 7.3). At best, less than half of the Scope 1, 2 and 3 emissions resulting from OPS activities are reported. The actual OPS GHG footprint would be higher, as the embodied emissions of procured products, other than constructed assets, are excluded from this estimate.

What are the government's largest emissions sources, sometimes called GHG hotspots? For the purpose of this analysis, we have defined a major hotspot as an emission source responsible for more than 10% of total emissions, with an intermediate hotspot representing 1%-10%. The embodied emissions associated with

AT BEST, LESS THAN HALF OF THE EMISSIONS RESULTING FROM OPS ACTIVITES ARE REPORTED

construction and building materials represent a major unreported hotspot – responsible for over half of the OPS emissions. The heating of government buildings is a major reported GHG hotspot, potentially generating 1/5 of emissions. OPS fleet driving, another reported emission, is also important – potentially responsible for close to 15% of OPS emissions.

If OPS employees follow the same commuting patterns as other Ontario workers (in terms of commuting distance and mode of transport used), employee commuting would represent an unreported intermediate GHG hotspot.

Including Scope 1, 2 and 3 GHG emission sources, the ECO estimates OPS emissions at more than double what the government reports – over half a million tonnes of CO_2e . Relative to the OPS, Ontario's Broader Public Service has an even larger GHG footprint and also fails to report much of its GHG footprint.

7.2.1 GHG Emissions from the Broader Public Sector

Ontario's Broader Public Sector (BPS) is much larger than the Ontario Public Service (OPS). It includes Ontario's health care sector, as well as Ontario's schools, colleges and universities. Over 700,000 people work in Ontario's BPS.¹⁴ In our estimate, the GHG footprint of the BPS in 2014 was over ten times larger than that of the OPS, or close to six million tonnes CO₂e, including both direct (Scope 1) and indirect (Scope 2 and 3) emissions. BPS emissions could amount to more than 3% of Ontario's total GHG emissions. More than half of BPS emissions are likely unreported. The BPS GHG footprint includes three major hotspots. The heating of buildings represents about one third of the GHG emissions for this sector. Another third of the footprint is caused by the unreported life-cycle emissions from construction and building materials. BPS fleet emissions are unknown, but would reach almost 15% of emissions should the GHGs from vehicle use per employee be similar to the OPS.

Employee commuting would be considered an intermediate hotspot, assuming that BPS employees follow the same commuting patterns as other Ontario workers. A rather surprising intermediate hotspot of emissions is found within the healthcare sector: the venting of anaesthetic gases, which are also powerful GHGs (as discussed in Appendix D, available online only at eco.on.ca).



Figure 7.3. A Sankey Diagram of the ECO's Estimate of the Reported and Unreported Scope 1, 2 and 3 GHG Emissions of the OPS and BPS (in megatonnes carbon dioxide equivalent – Mt).

WILL THE GOVERNMENT OFFSET THE TRUE GHG FOOTPRINT OF THE OPS?

In the *Climate Change Action Plan*, the province committed to be carbon neutral by 2018, by purchasing voluntary offsets. Will the government offset only the 200 kt CO_2 that it reports as OPS emissions? Or, will it offset the true GHG footprint of the OPS? Fortunately, the ministries say they are reviewing the methods they use to estimate their GHG emissions.

The ECO recommends that, to achieve carbon neutrality, the government should offset the GHG emissions for which it is directly and indirectly responsible. This would require detailed and transparent GHG accounting and reporting. The impressively detailed U.S. government document entitled *Federal Greenhouse Gas Accounting Reporting Guidance* could be used as a template.¹⁵

7.3 Conclusions and Recommendations

Ontario ministries are starting to think through the implications of climate change for the countless activities they undertake. We expect this understanding to improve in future years. Fortunately, the *Climate Change Action Plan*, ECO training and competition for cap and trade proceeds are nudging the whole government to consider climate change in its procurement, regulations, communications, policies and initiatives. Two key areas for improvement are: **Regulations:** The ministries do not post detailed estimates of how proposed regulations will impact GHG emissions. Thus, neither ministries nor the public can evaluate how a regulation may help or hinder the province from meeting its climate targets.

Where proposed regulations may have significant impacts on Ontario-wide GHG emissions (e.g., >10,000 t CO_2e/yr), all ministries should post regulatory impact statements on the Environmental Registry showing a cost-benefit analysis that includes a social cost of carbon, estimated consistently across ministries.

True Carbon Neutrality: At present, the OPS only reports emissions associated with the energy used in government-owned buildings and vehicles, as well as air travel by public service employees. To its credit, these GHG emissions are comparatively low. Nevertheless, most of the government's emissions likely originate from elsewhere in the life cycle: upstream (i.e., from production to procurement) and downstream (i.e., waste management). True carbon neutrality would require the OPS to incorporate all Scope 1, 2 and 3 emissions, and would likely more than double the number of offsets required.

To achieve carbon neutrality, the government should offset the GHG emissions for which it is directly and indirectly responsible.

Endnotes

- Infrastructure Ontario also received the questionnaire and advised that its responses were incorporated in the reply from the Ministry of Infrastructure.
- "Statements of Environmental Values", online: Government of Ontario <<u>http://www.ebr.gov.on.ca/ERS-WEB-External/content/index2.</u> jsp?f0=aboutTheRegistry.statement&f1=aboutTheRegistry.statement. value&menuIndex=0_3>. [Accessed August 14, 2017]
- 3. The Ministry of Finance is not a prescribed ministry under the Environmental Bill of Rights.
- Ontario Ministry of Infrastructure, Building Better Lives: Ontario's Long-Term Infrastructure Plan 2017 (Toronto: Ministry of Infrastructure, 2017) at 26.
- "Natural Gas Grant Program", online: Infrastructure Ontario <u>http://www. infrastructureontario.ca/NGGP/</u>. [Accessed September 7, 2017]
- Ontario Ministry of Finance, *Transparency in Taxation* (2015). The ECO discussed this issue in our 2015/2016 Annual Energy Conservation Progress Report, Conservation: Let's Get Serious, at 141.
- Ministry of the Environment and Climate Change, "Approval of the Côté Gold Project Environmental Assessment" (December 22, 2016), online: <u>https://www.ontario.ca/page/approval-cote-gold-projectenvironmental-assessment</u>. [Accessed December 11, 2017]; Ministry of the Environment and Climate Change, "Approval of the Rainy River Gold Mine Environmental Assessment" (September 20, 2015), online: <u>https:// www.ontario.ca/page/approval-rainy-river-gold-mine-environmentalassessment</u>. [Accessed December 11, 2017]
- Environment and Climate Change Canada, "Technical Update to Environment and Climate Change Canada's Social Cost of Greenhouse Gas Estimates" (Ottawa: Environment and Climate Change Canada, 2016) at iii.
- Example: WRI and WBCSD, "GHG Protocol. Corporate Value Chain (Scope 3) Accounting and Reporting Standard" (WRI and WBCSD, n.d.) at [04].
- 10. The Scope 1 emissions tracked by the OPS include those from energy use, but exclude any fugitive emissions from intentional or unintentional releases of GHGs during operations. All Scope 2 emissions are included, except for upstream emissions from fossil fuels consumed in government-owned buildings, and government-owned and leased vehicles.

- WRI and WBCSD, "GHG Protocol. Corporate Value Chain (Scope 3) Accounting and Reporting Standard" (WRI and WBCSD, n.d.) at 34-37.
- Environmental Commissioner of Ontario, Building Momentum. Results. Annual Energy Conservation Progress Report – 2012, vol 2 (Toronto, ECO, 2013) at 30.
- Council on Environmental Quality, Federal Greenhouse Gas Accounting and Reporting Guidance (Washington: Council on Environmental Quality, 2016) at 18.
- Ontario Ministry of Finance, *Commission on the Reform of Ontario's Public Services*. Report (Toronto, Ontario Ministry of Finance, 2012) at 363.
- Council on Environmental Quality, Federal Greenhouse Gas Accounting and Reporting Guidance (Washington: Council on Environmental Quality, 2016).

Taking Climate Change Seriously Across Government

7

Chapter 8 Low-Carbon Procurement

Abstract

Government procurement is an important tool that Ontario should use to help build a lowcarbon economy.

The Ontario government buys billions of dollars of goods, services and infrastructure every year, and has a large greenhouse gas (GHG) footprint to shrink. The government is a critical early market for low-carbon innovations in product and infrastructure design, and can pave the way for them to spread across the economy.

The Ontario government has made some efforts to green what it buys and builds, but there is much more to do. For example, the government tracks GHGs from the energy it uses directly, but ignores the embodied emissions of products and infrastructure.

The Ontario government has pledged to ensure low-carbon procurement and become carbon neutral. To reduce its GHG footprint from procurement, it must:

- 1. Insist on the disclosure of the total GHG footprint of each product or project subject to procurement, specifically where the procurement categories are known to be GHG intensive;
- 2. Give that footprint significant weight in procurement decisions;
- 3. Set a specific emissions-reduction target for procurement; and
- 4. Report annually on the effectiveness of low-carbon procurement initiatives.

"Government procurement policies and practices should be aimed at reducing GHG emissions, with best practices applied at all levels of government." Conference Board of Canada, 2017¹





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8.0 Government Procurement is Important

Due to their considerable spending power, governments can play an important role in shaping demand for goods, services and infrastructure. Every year the Ontario government alone purchases about \$1.9 billion in goods and services.² Examples include office supplies, furniture, food, clothing, vehicles, fuel, electricity, travel services, information technology and waste management. In addition, Ontario has committed to spend about \$190 billion on infrastructure over 13 years.³ This public procurement makes up about 2% of the province's annual \$798 billion Gross Domestic Product (2016).⁴

GOVERNMENTS CAN PLAY AN IMPORTANT ROLE IN SHAPING DEMAND FOR GOODS, SERVICES AND INFRASTRUCTURE



8.0.1 Whose Procurement?

This chapter focuses on goods and services that the Ontario government buys, as well as the infrastructure that it builds and maintains.⁵

In particular, it concentrates on procurement decisions that are governed by two provincial procurement directives, one for the Ontario Public Sector (OPS) and one for the Broader Public Sector (BPS).⁶ These directives are issued by the Treasury Board Secretariat, with support from the Ministry of Government and Consumer Services. They spell out responsibilities at each stage of the procurement process (see Appendix F, Section F1, available online only at eco.on.ca).

By government procurement we mean:

- All procurement by the ministries, agencies and other institutions to which the OPS Procurement Directive applies; and
- 2. Infrastructure procurement by the OPS and BPS (see Table 8.1).

In this chapter, procurement does not include other forms of government spending such as grants, entitlement agreements and shared cost agreements. Nevertheless, the ECO believes that a climate lens should be used in these spending areas as well (see Chapter 7).

Table 8.1. The Ontario Public Service (OPS) and the Broader

 Public Sector (BPS)⁷.

Ontario Public Service (OPS)

All ministries All provincial agencies Independent Electricity System Operator (IESO) Ontario Power Generation (OPG)

Broader Public Sector (BPS)*

Hospitals School boards Colleges Universities Community Access Corporations Children's Aid Society

*Publicly funded organizations that received public funds of \$10 million or more in the previous fiscal year are also considered a part of the BPS.



8.0.2 What is Low-Carbon Procurement?

There are many ways to make a product, and some produce more GHGs than others. Low-carbon procurement is designed to reduce the GHGs associated with products and materials purchased, and can succeed where carbon prices sometimes do not (see Appendix F, Section F2, available online only at eco.on.ca).

Low-carbon procurement is one type of green or sustainable purchasing, but green, sustainable and low-carbon purchasing policies are not always the same. Low-carbon policies focus narrowly on GHGs. Green product criteria commonly address GHGs, resource conservation (e.g., water, energy, mined and harvested materials), biodiversity protection, and pollution reduction. Sustainable product criteria are even broader, adding local economic benefits, as well as health, safety and labour standards.⁸

Figure 8.1 illustrates how these categories overlap. Typically, more products meet low-carbon criteria than green criteria, and more products meet green criteria than sustainable criteria. A low-carbon product may not be a green product, e.g., due to toxic emissions or habitat loss. A green product may not be a sustainable product, e.g., due to health and safety violations associated with its production.



Low-carbon

Evaluation criteria are used to reduce GHG emissions relative to conventional procurement options

Green

Evaluation criteria include performance indicators beyond GHG mitigation (e.g., energy efficiency, habitat protection, material circularity, natural resource conservation, removal of toxins, waste prevention, water conservation)

Sustainable

Evaluation criteria include environmental, economic and social performance indicators

Figure 8.1. Comparing low-carbon, green, and sustainable procurement.

LOW-CARBON PROCUREMENT CAN SUCCEED WHERE CARBON PRICES SOMETIMES DO NOT

Policies to reduce the environmental footprint of government purchases are now common; over 50 national governments have sustainable public procurement policies.⁹ In Canada, the federal government, and some provinces and municipalities have green procurement policies, which may include GHG reduction and carbon neutrality targets. The Government of Canada has had a policy on green procurement since 2006. For some types of procurement by the federal government, procurement managers look at both the retail price and the evaluated price, which includes life-cycle costs (see Appendix F, Section F3, available online only at eco. on.ca).¹⁰ Green procurement targets are set in the Federal Sustainable Development Strategy, and progress is reported annually.

At the provincial level, public procurement in British Columbia has guidelines for environmentally responsible procurement, considering multiple types of environmental impacts.¹¹ These guidelines support B.C.'s target to become carbon neutral, as documented in annual progress reports.¹²

In the United States, some states such as California have adopted a different approach. This state sets a maximum acceptable GHG intensity for the procurement of certain materials known to have high emissions.¹³

The ECO believes that Ontario government purchases should be both green and sustainable, but this chapter focuses on the impact of procurement on GHGs.

8.1 Why Does it Matter?

8.1.1 The Government's Large GHG Footprint

As discussed in Chapter 7, the government has a large GHG footprint, which a low-carbon procurement policy can help to reduce. For example, green procurement in seven European countries produced an average GHG emissions reduction of 25% when compared to business-as-usual procurement practices, as well as a 1% reduction in costs.¹⁴

8.1.2 A Critical Early Market for Low-Carbon Innovations

Low-carbon procurement policies stimulate market demand for low-carbon products. For new Ontario businesses with innovative products, the government provides a vital early market. Without this support, Ontario clean tech companies often fall into the socalled 'valley of death' – the perilous interval between the early stage of research and development and market entry.¹⁵

GOVERNMENT USE OF LOW-CARBON PRODUCTS SETS A POWERFUL EXAMPLE FOR OTHERS TO FOLLOW



8.1.3 An On-Ramp for the Rest of the Economy

An OPS focus on low-carbon procurement can pave the way for the broader public sector and the rest of the economy. For example, methods implemented to support OPS procurement would facilitate low-carbon procurement by everyone else. Government use of lowcarbon products sets a powerful example for others to follow, and demonstrates the effectiveness of these products to prospective buyers at home and abroad. Foreign buyers have more confidence when home jurisdictions use a product. Buyers tend to be hesitant about adopting innovative products and practices until they have seen them working.

A recent OECD report concludes that these indirect effects may be more important than the direct GHG impact of what the government buys.¹⁶

8.2 Procurement With One Eye Open

8.2.1 A Good Start

The provincial government has made a good start at reducing its GHG footprint, but there is much more to do.

In 2009, the OPS Green Office at the Treasury Board Secretariat introduced a *Green Transformation Strategy*. This strategy featured GHG-reduction targets and other initiatives to promote green business practices within the government's operations. Commendably, the OPS has already reached the GHG-reduction target set in 2009, which was to reduce emissions from OPS energy use 27% by 2020/2021, relative to a 2006 baseline. This accomplishment was speeded by Ontario's phase out of coal-fired power plants, which dramatically reduced the GHG footprint of Ontario electricity. Unfortunately, this GHG target does not include the emissions from non-energy procurement, which are likely the majority of OPS emissions (see Chapter 7).

The OPS Green Office supported and co-ordinated a number of excellent initiatives that reduced the environmental impacts of procurement (Table 8.2). As well, over 100 Green Teams in OPS ministries led projects with low-carbon benefits (e.g., Paperless Office Competition, Earth Day Battery Recycling Challenge).¹⁷ Table 8.2. Examples of OPS Initiatives that would reduce the GHGs associated with procurement.¹⁸

Focus of Initiative	Examples
Reducing fuel use in fleet vehicles	In the OPS fleet of 5,500 vehicles, 26% are hybrids and 2% are electric. The number of hybrid/electric vehicles in the OPS fleet has increased by 15 times over ten years. <i>Are these GHG reductions measured</i> ? Yes Have GHGs decreased from the 2006 baseline? Yes
Reducing energy consumption in buildings	Leadership in Energy and Environmental Design (LEED®) certification is mandated for all government-procured new buildings and major renovation projects in Ontario. A 'retro-commissioning' program that reports on building operations and identifies opportunities for improvement has been implemented in 16 government facilities since 2012. <i>Are these GHG reductions measured</i> ? Yes Have GHGs decreased from the 2006 baseline? Yes
Reducing business travel	Training was provided for OPS employees to learn best practices for making web meetings interactive, engaging and collaborative. In 2015/2016, over 6,200 video conferences were held, replacing business travel. This represented a 55% growth in video conferences relative to the previous year. Are these GHG reductions measured? Yes (air travel); No (all forms of transport other than OPS fleet – e.g., taxis and car rentals) Have GHGs decreased from the 2006 baseline? Yes (air travel)
Cutting paper consumption	Double-sided printing has been standardized throughout the OPS. A Central Forms Repository was set up to facilitate the download of online forms. An electronic submission process for procurement was initiated. <i>Are these GHG reductions measured?</i> No
Increasing waste diversion	 Annual waste audits are performed at all government-owned facilities over 10,000 m². In 2015/2016, the OPS: recycled over 4 million kg of office paper; reused 17,160 surplus furniture items (redeployed to developing countries and other OPS offices); and ensured that all of its electronic waste was recycled (almost 3,000 tonnes recycled since 2007/2008). Are these GHG reductions measured? No





An example of a hybrid vehicle used in the OPS fleet.¹⁸ Photo Credit: Government of Ontario

In December 2014, the Treasury Board Secretariat issued an OPS Procurement Directive that contains some sustainability requirements. For example, reduction, reuse and recycling measures are to be considered in all procurements. Waste management plans must be submitted for procurements that include designated materials. Procurements valued at or over \$10,000 are supposed to meet environmental standards such as EcoLogo[®].¹⁹

The OPS Directive requires some categories of products to meet specific environmental standards. For example, computers procured by the OPS must meet EPEAT® Silver or Gold standards.²⁰ However, similar products, such as touchscreen monitors, have no environmental criteria. And some products on OPS product ordering lists are clearly not sustainable, such as cleaning supplies with triclosan.²¹

Similarly, the Directive for Major Public Infrastructure Projects states that a major infrastructure project must demonstrate how it promotes the "achievement of the government's other policy objectives or priorities, such as climate change (including government targets for emissions reductions)."²² The Operational Policy for this Directive specifies that, for major infrastructure projects, the project sponsor will provide information about its strategies to reduce life-cycle GHG emissions. However, the means of taking this information into account in the procurement decision is left unspecified. The procurement of infrastructure remains tightly focused on minimizing capital cost and construction time, not on reducing GHGs.

Overall, there is a notable disconnect between the environmental promises of the Directives and the actual products and materials that the government buys. There is also a lack of accountability. The government produces an internal report of its GHG emissions from energy use every year. However, little information is made public about the GHG impacts of OPS procurement. The government does not even clearly disclose its procurement policies. For example, the OPS does not make public when EcoLogo[®] and EPEAT[®] environmental standards are required.

THERE IS A NOTABLE DISCONNECT BETWEEN THE ENVIRONMENTAL PROMISES OF THE DIRECTIVES AND THE ACTUAL PRODUCTS AND MATERIALS THAT THE GOVERNMENT BUYS



The Ontario Public Sector's GHG-reduction targets set in 2009 have now been superseded. The 2016 *Climate Change Action Plan* (CCAP) includes a more ambitious commitment: to have the OPS be carbon neutral by 2018. Will this pledge apply to the full GHG footprint of the OPS?

The CCAP states that the OPS Procurement Directive will be revised to include mandatory low-carbon criteria in procurement, "considering the full life cycle of products."²³ This promise has not yet been implemented.

8.2.3 Total (Life-Cycle) GHGs

The promise to include life-cycle GHGs in procurement is important. Today, the Ontario government acknowledges the GHGs from the energy it uses directly, but it largely ignores the upstream and downstream GHG impacts of what it buys and builds.

The government reports the GHG emissions from the energy it uses to operate its buildings. However, these assets also have substantial embodied emissions that take place during the material extraction, processing, transportation, installation and waste management stages of their life cycles. These embodied emissions are not trivial. For example, over 20% of a building's GHG impact is typically the embodied carbon in the structure.²⁴ Embodied emissions are not only relevant for infrastructure projects. For example, the embodied emissions associated with the computers and monitors used by the OPS likely exceed the emissions from all OPS air travel.²⁵



This upstream stage is important too. Photo credit: Government of Ontario

Figure 8.2 illustrates the cumulative operating and embodied emissions of a hypothetical project over time and identifies the difference between the current government GHG emissions focus and the full life-cycle GHG emissions.



Operating emissions Associated with the energy

used by the asset. Take place over the life of the asset.

Embodied emissions

Associated with the manufacture, transportation, installation and disposal of an asset. Take place at the beginning and end of the asset life.

Figure 8.2. The cumulative GHG emissions of a hypothetical project, including operating and embodied emissions.²⁶ Note: additional embodied emissions take place at the end of life of the asset (end-of-life emissions were omitted to simplify the graph).

Under the current procurement directives, the government tends not to track, report and value embodied emissions. As a result, the government understates its GHG footprint, and may unwittingly make procurement decisions with unnecessarily high GHG impacts.

For example, steel and concrete have substantial embodied GHG emissions and are likely a large part of the government's full GHG footprint (see Chapter 7). Some steel and concrete production methods generate fewer emissions (e.g., embedding carbon dioxide into concrete²⁷ and increasing the recycled content of steel). Transportation emissions can also be significant. The government can therefore reduce its GHG footprint by purchasing lower-emission versions of steel and concrete. Yet the current procurement directives ignore the fact that apparently interchangeable materials may have different embodied emissions.



Examples of materials used in buildings and infrastructure.

Photo credit: Morguefile

Embodied emissions could be reduced through lightweighting/dematerialization, increased life-span/ durability, as well as improved design to facilitate repair, upgrading, reuse, disassembly and recycling. But the government is unlikely to reduce embodied emissions if it does not measure and report them.

Durability – Paving for Tomorrow

GHG emissions can be reduced by putting an emphasis on durability when procuring products and infrastructure. This is an area where the government has a problematic record. For instance, the 2016 Auditor General's report noted that some Ontario highways have life spans 50% to 60% shorter than the normal 15 years, due to cheaper materials mixed into their asphalt.²⁸ Recently, the Ministry of Transportation has started to phase in an "extended aging" test in its asphalt procurement, which is intended to ensure that asphalt reaches its expected life span.²⁹ Shorter road life spans increase embodied GHG emissions due to additional construction work and materials required.

Additionally, under the more extreme weather conditions predicted under a changing climate, infrastructure may become more vulnerable to damage and failure. For example, results from a recent U.S. study indicated that the failure to update pavement engineering policy and practice to adapt to changing climate conditions will result in considerable additional costs due to shorter life spans.³⁰



Six-year-old highway with premature cracks in Coldwater, Ontario. Photo credit: Ministry of Transportation.

8.3 Procurement with Both Eyes Open

8.3.1 Disclosing the Total GHG Footprint of High-Emission Products and Materials

A significant obstacle to cost-effective low-carbon procurement has been the lack of credible comparable data on the total GHG footprint of competing products. The first step in procurement with both eyes open is for the government to know the total GHG footprint of the products and materials that it buys. The government can and should insist on its suppliers providing such information – especially for high GHG products and materials.

Vendors can supply this information using life-cycle assessment (LCA) and/or environmental product declarations (EPDs).

LCAs account for the total environmental impacts of products throughout their life cycles, from raw material extraction to end-of-life (Figure 8.3).³¹ An LCA can evaluate a product life cycle 'cradle-to-grave,' or preferably, 'cradle-to-cradle' (i.e., via reuse or recycling). A SIGNIFICANT OBSTACLE TO COST-EFFECTIVE LOW-CARBON PROCUREMENT HAS BEEN THE LACK OF CREDIBLE COMPARABLE DATA

LCAs aim to include all GHG emissions, regardless of which organization controls the emissions; in other words, both direct and indirect. Direct emissions are from sources owned or controlled by an organization; indirect emissions result from an organization's activities, but occur at sources owned or controlled by other organizations (i.e., those that are part of the procurement supply chain).

Detailed LCAs take time and resources to complete, but streamlined approaches are available, using LCA software and databases.



Figure 8.3. A typical 'cradle-to-grave' product life cycle for a procured asset.

LCAs are typically bespoke. An even more streamlined method to communicate the total GHGs of a material or product is for the vendor to supply a standard environmental product declaration. An EPD is a registered, independently verified document that communicates the life-cycle environmental impact of a product.³² One can use EPDs to compare the life-cycle GHG emissions of one product with another, which makes it easier for a buyer to choose products with lower emissions. However, ensuring credible and comparable GHG estimates is challenging (see text box below).

The Ontario government should require procurement bids to include EPDs and/or LCAs when the products/ materials are traditionally GHG intensive. To ensure accuracy, credibility and comparability, EPDs and/ or LCAs for major purchases should be coupled with rigorous auditing and verification procedures.

Ensuring Credible GHG Estimates

Credible EPDs and/or LCAs should, as much as possible, represent the conditions at a particular factory and/or work site, not industry-average conditions. Why is this important? The GHG intensity of a product is often highly dependent upon the location of production - e.g., the climate impact from producing an aluminum ingot in China is about five times higher than if it is produced in Quebec.³³

Product GHG intensity also depends on the type of technology used. For crude steel production, the basic oxygen furnace and electric arc furnace are the two main options used. The former, accounting for about three-quarters of global steel production, is far more GHG intensive (i.e., tonne of CO₂ / tonne

Ontario is beginning to take LCA seriously, especially in its infrastructure procurement. The Ministry of Infrastructure's Long-Term Infrastructure Plan outlines the Ontario government's intentions with LCA. Its plans include: (1) "Starting in 2019, the Province plans to roll out LCA broadly as a tool to support evidence-based infrastructure decisions"; and (2) "Ontario will work toward having a LCA for major infrastructure projects by mid-2020."37

of crude steel) than the latter.³⁴ Other important methodological issues, such as the awarding of the recycling credit, also need to be addressed to ensure credible impact estimates.35

Although EPDs must be independently verified, quality control and representativeness remains a very important issue. Both EPDs and LCAs can use inconsistent datasets, different system boundaries and modelling assumptions. Some jurisdictions such as the Netherlands, Germany, France and Belgium have addressed this issue by having their own EPD databases.³⁶ This could take some time to set up, and EPDs must be kept up to date to ensure that they remain representative. The ECO encourages the government to explore this option.

Beyond the Life Cycle: Induced Emissions

LCA and EPDs will, at best, show the total GHG emissions of a product, project or material. For infrastructure projects, these accounting tools omit possibly the biggest impact on GHG emissions: how the projects affect the communities that they serve. These *induced emissions* are made necessary as a result of the design and placement of a newly constructed asset. For example, locating a hospital in a difficult to access location may force patients and employees to have a lengthy daily commute by car. The additional emissions caused by this travel would almost certainly surpass the embodied and operational emissions of the hospital over its expected life span.

This potentially much larger impact is beyond the scope of this chapter.

8.3.2 Making the GHG Footprint Matter in Procurement Decisions

Once the government has credible information about the total GHG footprint of competing products and materials, how will it use that information? The government should set out a clear strategy in its procurement directives for giving GHGs weight. Options include:

- 1. Eco-labels and standards
- 2. Performance specifications
- 3. Points in a procurement evaluation
- 4. Social cost of carbon

These options can be complementary (i.e., 1 or 2 can be used in conjunction with 3 or 4) or mutually exclusive (i.e., 3 and 4). The first two options specify

THE GOVERNMENT SHOULD SET OUT A CLEAR STRATEGY FOR GIVING GREENHOUSE GASES WEIGHT

minimum GHG and/or environmental performance thresholds for products and projects under consideration. In contrast, options 3 and 4 address how GHGs are valued in procurement evaluations, and are mutually exclusive. Points in a procurement evaluation can be used to give GHGs a higher or lower value than a social cost of carbon.

Low-carbon procurement procedures could be quickly phased in for high GHG categories, beginning with demonstration procurements using revised bidding and evaluation criteria. This would help both the vendors and procurement managers gain expertise with the new system before a widespread roll-out.

1. Eco-labels and Standards

Eco-labels/certifications (e.g., EcoLogo®) can simplify the procurement process if only those products that bear the label may be procured. The OPS Directive mandates such labels/certifications for procurements above \$10,000. Unfortunately, it is not clear how rigorously this requirement is followed. In addition, the government does not disclose how many of its procurements are priced at less than \$10,000. These lower-cost purchases may, in total, have large GHG impacts. For example, office paper consumption, about 60 kg per OPS employee per year,³⁸ may create considerable emissions.

Eco-labels/certifications do have limitations. For example, innovation freeze can result if lists of accredited products are not kept up to date (i.e., recently introduced, innovative products may not be included).³⁹ Also, ecolabels/certifications may not differentiate between good, better and best products. Therefore, eco-labels are imperfect tools, and some method of proving *equivalent or better* may be appropriate.

Due to the substantial emissions associated with the construction and use of buildings, various low-carbon or green building standards have been introduced. LEED® is the most well-known and widely-used green building rating system in North America⁴⁰ and LEED® Building Design + Construction Silver certification is mandatory for new government buildings and major renovations. There are 1,248 buildings in Ontario that have met the LEED[®] building criteria.⁴¹ Previous versions of LEED[®] did not consider the embodied GHG emissions of building materials/construction, although the current version does include relevant optional credits. Other environmental building standards relevant for Ontario include the recently introduced Canada Green Building Council Zero Carbon Building Standard⁴² and the Toronto Green Standard.⁴³ As with LEED[®], embodied emissions reductions are optional credits under these alternative green building standards. Therefore, although green building standards tend to reduce GHG emissions, they are not sufficient to ensure that embodied emissions are low.44

2. Performance Specifications

Buyers can set a maximum GHG intensity for highemission products and materials, while leaving the vendor with flexibility to meet these specifications. Buyers should be able to set stringent performance requirements, even if only one or two suppliers can meet them.

For example, California law AB-262 requires a "maximum acceptable global warming potential" to be set for procuring four GHG intensive materials ("eligible materials"): structural steel, carbon steel rebar, flat glass and mineral wool board insulation.⁴⁵ These limits are to be reviewed every three years, and adjusted downwards as industry improves. Project bidders must

submit facility-specific EPDs of the projects' eligible materials, demonstrating compliance with GHG limits.

Recycled Content Specifications as a Means of Reducing Procurement Emissions

The GHG emissions of procured products and infrastructure can also be reduced by specifying minimum recycled content levels for certain materials.

In our 2017 waste and environmental protection reports, the ECO looked at the environmental benefits of using procurement policies to increase demand for products that incorporate recycled content. The ECO recommended that the government prioritize the use of recycled aggregate in its infrastructure. Would adoption of this recommendation contribute to the government's low-carbon procurement objective? Other jurisdictions have witnessed dramatic benefits from using recycled aggregates. For example, a recent LCA of aggregate use in Hong Kong found that coarse aggregate derived from construction and demolition waste produced about a third of the GHGs of mined aggregate.⁴⁷



Production of aggregate. Photo credit: Morguefile.



3. Points in a Procurement Evaluation

The GHG footprint can be given considerable weight in procurement evaluation criteria. This works best in outcomes-based procurement, where the specific method to produce the outcome is left to the bidder.⁴⁸

For example, the *Future of the Fjords* ferry procurement in Norway⁴⁹ gave sustainability criteria a high weight (40% of the evaluation score), and demanded a minimum level of energy efficiency (a 15% reduction in mean energy use), but did not specify any particular technology. This resulted in the world's first electric ferry, and an 89% reduction in GHGs.⁵⁰

4. Social Cost of Carbon

Climate change is responsible for many types of present and future environmental damage that has economic implications, such as loss of infrastructure and reduced agricultural production. A social cost of carbon (SCC) is an attempt to quantify this damage in financial terms, so as to internalize it into economic decisions, such as procurement.⁵¹ In other words, an SCC puts a dollar figure on the predicted incremental damage from each tonne of GHG emissions. This cost can be deducted from the value of high-emission products and materials, levelling the playing field for lower GHG competitors.

The SCC indicator has been used in cost-benefit analyses of some U.S. and Canadian federal policy initiatives and regulations.⁵² The current Canadian federal SCC is \$41/t CO_2e .⁵³ This is higher than the carbon price in Ontario's most recent auction of GHG allowances (less than \$20/t CO_2e).

An SCC could simplify procurement by translating GHG impacts into a single dollar figure. However, there is a great deal of uncertainty associated with SCC estimates⁵⁴ and there are disadvantages to having more than one carbon price in a single economy (e.g., SCC vs. Ontario's carbon allowance price) (see Appendix F, Section F4, available online only at eco. on.ca). Nevertheless, making procurement decisions without attaching *some* dollar figure to GHG emissions effectively treats the SCC as zero. Whatever the correct SCC may be, it is definitely not zero.

The Ministry of the Environment and Climate Change is evaluating the possible use of an SCC in government decision making, including procurement.

8.4 Conclusions and Recommendations

The Government of Ontario has taken some commendable first steps to reduce the carbon footprint of what it buys and builds. Leadership by the OPS Green Office and the enthusiasm of OPS employees were key in exceeding the OPS' 2009 GHG-reduction targets. Much greater focus on low-carbon procurement will be needed, however, to meet the government's ambitious goal of becoming carbon neutral, as promised under the CCAP. Adopting best practices and learning from leading jurisdictions will be essential.

The government should:

- Insist on the disclosure of the total GHG footprint of each product or project subject to procurement, specifically where the procurement categories are known to be GHG intensive;
- Give that footprint significant weight in procurement decisions;
- Set a specific emissions-reduction target for procurement; and
- Report annually on the effectiveness of lowcarbon procurement initiatives.

Endnotes

- The Conference Board of Canada, Shaping the Canadian Low-Carbon Economy: A Discussion Paper (Toronto: The Conference Board of Canada, 2017) at 21.
- Ontario Ministry of Government and Consumer Services, information provided to the ECO in response to ECO inquiry (30 June, 2017). Estimate derived from 2014/2015 data.
- This expenditure began in the fiscal year 2014-2015. "Ministry of Infrastructure", online: Ministry of Infrastructure, <<u>www.ontario.ca/page/</u><u>ministry-infrastructure</u>>. [Accessed November 7, 2017]
- "Ontario Factsheet July 2017", online: Ontario Ministry of Finance, <<u>www.fin.gov.on.ca/en/economy/ecupdates/factsheet.html</u>>. [Accessed August 14, 2017]
- The Ontario government's infrastructure includes about 5,000 schools, 24 colleges, 140 hospitals, 17,000 km of highways, 2,800 bridges, transit networks, office buildings, and other buildings such as prisons. Ministry of Infrastructure, *BUILD ON 2017 Infrastructure Update* (Toronto: MOI, 2017) at 10.
- Treasury Board Secretariat/Management Board of Cabinet, OPS Procurement Directive (Toronto: TBS, 2014). Treasury Board Secretariat/ Management Board of Cabinet, Broader Public Sector (BPS) Procurement Directive (Toronto: TBS, 2011).
- Definition of the Ontario Public Service "Draft Public Service Procurement Directive", online: Treasury Board Secretariat (TBS) <<u>www.ontario.ca/page/ontario-public-service-procurement-directive</u>>. 19 December, 2017 update.

Definition of the Broader Public Sector - Treasury Board Secretariat/ Management Board of Cabinet, *Broader Public Sector (BPS) Procurement Directive* (Toronto: TBS, 2011) at 3.

- European Commission, Buying Social. A Guide to Taking Account of Social Considerations in Public Procurement (Luxembourg: Publications Office of the European Union, 2010) at 8.
- 9. OECD, The Role of Public Procurement in Low-carbon Innovation, (Paris: OECD, 2016) at 4.
- 10. OECD, Going Green: Best Practices For Sustainable Procurement (Paris: OECD, 2015) at 61.
- "Guidelines for Environmentally Responsible Procurement", online: Government of British Columbia <<u>www2.gov.bc.ca/gov/content/</u> governments/services-for-government/bc-bid-resources/referenceresources/green-procurement/guidelines-for-environmentallyresponsible-procurement>. [Accessed August 14, 2017]
- 12. The B.C. government, like Ontario, still limits its GHG accounting to those emissions from energy use of everyday operations, while ignoring upstream and downstream emissions.
- "AB-262 Public contracts: bid specifications: Buy Clean California Act", online: California Legislative Information<<u>leginfo.legislature.ca.gov/faces/</u> <u>billTextClient.xhtml?bill_id=201720180AB262></u> [Accessed October 23, 2017]
- PWC Sustainability, Collection of statistical information on Green Public Procurement in the EU. Report on data collection results findings (PWC Sustainability, 2009) at 70.

- 15. Environmental Commissioner of Ontario, *Facing Climate Change*, (Toronto: ECO, 2017) at 115-116.
- 16. OECD, The Role of Public Procurement in Low-carbon Innovation, (Paris: OECD, 2016) at 20.
- "Ontario Public Service (OPS) recognized as one of Canada's top 100 employers (2017)", online: MediaCorp Canada Inc. <<u>content.eluta.ca/</u> <u>top-employer-ontario-government</u>> [Accessed August 14, 2017]
- Ministry of the Environment and Climate Change (MOECC), information provided to the ECO in response to ECO inquiry (4 July, 2017). Ministry of Infrastructure (MOI), information provided to the ECO in response to ECO inquiry (19 July, 2017).
- 19. EcoLogo®/Environmental Choice® is an eco-labeling standard that was first introduced in Canada and is now used by countries around the world. The Industry Canada website includes the claim that "EcoLogo standards are designed so that only the top 20% of products available on the market can achieve certification" ("Common Environmental Labels and Claims in Canada", online: Innovation, Science and Economic Development Canada www.ic.gc.ca/eic/site/oca-bc.nsf/eng/ca02523.html. [Accessed August 14, 2017]). However, the ECO has been unable to confirm the veracity of this claim, as it does not exist in the documentation for the standard.
- Ontario Ministry of Government and Consumer Services, "IT Hardware VOR Number/Title: OSS-00466131 - Desktop Management Services and Products (DMSP-03). Appendix Q - Product Specifications Detailed Instructions."
- Last year, an assessment report undertaken by Environment and Climate Change Canada and Health Canada claimed that the release of triclosan into the environment poses a risk to harm to organisms. Reference: Environment and Climate Change Canada; Health Canada, Assessment Report: Triclosan: Chemical Abstracts Service Registry Number 3380-34-5 (2016), online: ECCC <<u>www.ec.gc.ca/ese-ees/default.</u> asp?lang=En&n=65584A12-1&offset=1&toc=show#toc00>.
- 22. Treasury Board Secretariat, Directive for Major Public Infrastructure Projects (2015) at 5.
- 23. Ministry of the Environment and Climate Change, Ontario's Five Year Climate Change Action Plan 2016-2020 (Toronto: MOECC, 2016) at 49.
- 24. Julian M. Allwood & Jonathan M. Cullen, *Sustainable Materials With Both Eyes Open* (Cambridge, England: UIT Cambridge Ltd., 2012) at 230.
- 25. The embodied emissions of a desktop computer and one monitor is estimated at about 525 kg of CO₂e (IPCC AR5 method), based on the ecoinvent 3 LCA database. Assuming one computer and one monitor per OPS employee, and using the Treasury Board Secretariat's estimated life spans for these devices (four years for a desktop computer, six years for a monitor), the embodied emissions would amount to about 6.8 kt of CO₂e (OPS air travel was 5.2 kt CO₂e in 2015).
- Adapted from a graph in O'Connor and Bowick 2016. J. O'Connor and M. Bowick, "Embodied Carbon of Buildings International Policy Review" (Ottawa: Athena Sustainable Materials Institute, 2016) at 11.
- 27. "Technology", online: Carbon Cure <<u>carboncure.com/technology/</u>>. [Accessed August 14, 2017]

8
- Office of the Auditor General of Ontario, 2016 Annual Report Office of the Auditor General of Ontario (Toronto, Office of the Auditor General, 2016) at 529-531.
- Office of the Auditor General of Ontario, 2016 Annual Report Office of the Auditor General of Ontario (Toronto, Office of the Auditor General, 2016) at 536.
- B.S. Underwood et al. "Increased costs to U.S. pavement infrastructure from future temperature rise" (2017) 7 Nature Climate Change, 704 at 705.
- "EPDs and PCRs", online: Canadian Standards Association Group <<u>www.csaregistries.ca/epd/about_epd_pcrs_e.cfm</u>>. [Accessed August 14, 2017]
- "The International EPD Standard", online: EPD. The International EPD Standard <<u>www.environdec.com/</u>> [Accessed November 7, 2017]
- Estimate based on IPCC AR5 GHG results using the ecoinvent LCA database for virgin aluminum ingot production (recycled content allocation method).
- 34. World Steel Association, Steel Statistical Yearbook 2017, (Brussels: World Steel Association, 2017) at 16. In comparing crude steel production in China, Germany, Mexico, and the U.S., production using the electric arc furnace is up to five times better in terms of GHG intensity (A. Hasanbeigi et al. "Comparison of carbon dioxide emissions intensity of steel production in China, Germany, Mexico and the United States" (2016) 113 Resources, Conservation and Recycling, 127 at 134).
- 35. One example for infrastructure expected to have a long lifespan (i.e., several decades), LCAs and EPDs should not use the 'avoided burden' method to calculate net GHG impacts. This method permits a product producer to claim an immediate recycling credit for an impact reduction which may (or may not) take place 100 years from now. In 100 years, the production techniques for infrastructure materials will almost certainly differ, changing the magnitude of the actual impact credit. Moreover, the climate benefit of an immediate emissions reduction is far greater than one which may or may not take place decades from now.
- R. Zizzo et al., Embodied Carbon of Buildings and Infrastructure— International Policy Review (Forestry Innovation Investment Ltd., 2017) at vi.
- Ontario Ministry of Infrastructure, Building Better Lives: Ontario's Long-Term Infrastructure Plan 2017 (Toronto: Ministry of Infrastructure, 2017) at 26.
- 38. Data on office paper recycling in 2015/2016 was provided to the ECO from the MOECC. The MOECC claims that over 4 million kg of office paper was recycled. Based on this claim, the ECO has assumed that 4 million kg of office paper are consumed by the OPS annually.
- 39. OECD, The Role of Public Procurement in Low-carbon Innovation, (Paris: OECD, 2016) at 19.
- Athena Sustainable Materials Institute (ASMI), *Embodied Carbon of Buildings. International Policy Review* (Ottawa: ASMI, 2016) at 25.
- "Green Building Map", online Canada Green Building Council. Greater Toronto Chapter <<u>www.cagbctoronto.org/initiatives/green-building-</u> <u>map</u>>. [Accessed November 10, 2017]

- 42. Canada Green Building Council, *Zero Carbon Building Standard* (Vancouver, Canada Green Building Council, 2017) at 27.
- "Toronto Green Standard Version 2.0 Checklist", online: City of Toronto <<u>www1.toronto.ca/City%20Of%20Toronto/City%20Planning/</u> Developing%20Toronto/Files/pdf/TGS/2017TGS_MidHiRise_Checklist. pdf>. [Accessed August 14, 2017]
- 44. For example, one of the LEED® optional credits for the urban heat island effect encourages the use of highly reflective roof materials. A recent study compared two commonly-used roof membranes (W.O. Collinge, C.L. Thiel, N.A. Campion, S.G. Al-Ghamdi, C.L. Woloschin, K. Soratana, A.E. Landis and M.M. Bilec, "Integrating life cycle assessment with green building and product rating systems: North American perspective" 118 Procedia Engineering (2015) 662 at 666-667). One product is white, highly reflective and would qualify to contribute to the LEED® credit. The other product, a black material with low reflectivity, would not be eligible to contribute to the credit. When compared across the product life cycle, the second product would result in lower total GHGs because it has lower emissions during manufacturing. In this particular case, the credit is unintentionally encouraging the use of a product that increases life-cycle emissions. This example shows of importance of considering embodied emissions and using a life-cycle approach in low-carbon procurement decision making.
- "AB-262 Public Contracts: Bid specifications: Buy Clean California Act", online:California Legislative Information <<u>leginfo.legislature.ca.gov/faces/</u> <u>billTextClient.xhtml?bill_id=201720180AB262</u>>. [Accessed October 23, 2017]
- 46. Environmental Commissioner of Ontario, *Good Choices, Bad Choices* (Toronto: ECO, 2017) at 178.
- M. Uzzal Hossain et al., "Comparative environmental evaluation of aggregate production from recycled waste materials and virgin sources by LCA" (2016) 109 Resources, Conservation and Recycling 67 at 67.
- Clean Energy Canada, *The Power of Procurement: How governments* can drive clean growth, cut carbon and create jobs (Vancouver: Clean Energy Canada, 2017) at 5.
- 49. OECD, The Role of Public Procurement in Low-carbon Innovation, (Paris: OECD, 2016) at 17.
- 50. OECD, The Role of Public Procurement in Low-carbon Innovation, (Paris: OECD, 2016) at 17.
- Environmental Defense Fund, the Institute for Policy Integrity, and the Natural Resources Defense Council, Omitted Damages: What's Missing From the Social Cost of Carbon by Peter Howard (2014), online: <costofcarbon.org/files/Omitted Damages Whats Missing From the Social Cost of Carbon.pdf> at 1.
- Environment and Climate Change Canada, Technical Update to Environment and Climate Change Canada's Social Cost of Greenhouse Gas Estimates (Ottawa: Environment and Climate Change Canada, 2016) at 1.
- Environment and Climate Change Canada, Technical Update to Environment and Climate Change Canada's Social Cost of Greenhouse Gas Estimates (Ottawa: Environment and Climate Change Canada, 2016) at iii.
- Environment and Climate Change Canada, Technical Update to Environment and Climate Change Canada's Social Cost of Greenhouse Gas Estimates (Ottawa: Environment and Climate Change Canada, 2016) at 2.

Chapter 9 Climate Change Impacts in Ontario

Abstract

Here in Ontario we are already feeling the effects of climate change. Higher average temperatures, more climate extremes and the increased incidence of drought, storms, and unseasonable temperatures are affecting people across the province.

Climate Change Impacts in Ontario



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Health 9.0

Ontarians' health is already being affected by climate change. Hotter summer weather, especially when combined with the urban heat island effect, is particularly dangerous for elderly people, children, people who are marginally housed or homeless, and those with pre-existing health conditions, all of whom are more at risk of heatrelated illness.

According to Toronto's Medical Officer of Health,

Extreme heat is associated with health impacts ranging from heat stress to heat stroke and death. Those most vulnerable to heat include isolated seniors, people with chronic and pre-existing illnesses, children, and people who are marginally housed or homeless. In Toronto, in addition to those who are homeless or underhoused, people who live in older

apartment buildings may be at particular risk from heat. The majority of these buildings are not air conditioned, many are home to low income families and newcomers, and more than half of residents surveyed say that they experience symptoms of heat-related illness.1

Tropical nights (defined as those with a minimum temperature over 20°C) make it harder to sleep without air conditioning, exacerbating social inequalities. Children and teachers may struggle in hot portable classrooms in June and September. Other public facilities, such as public transit, are also increasingly uncomfortable without air conditioning. Vulnerable people can also be among those most affected when extreme weather events disrupt electricity service.

These heat-related impacts will grow in the much hotter summers ahead of us.



Shifting Distribution of Temperature Anomalies: Northern Hemisphere Land, June-July-August

Figure 9.1. Shifting distribution of summer temperature anomalies in the northern hemisphere.

Source: NASA Goddard Institute for Space Studies and Columbia University Earth Institute, Public Perception of Climate Change and the New Climate Dice, 2016.



Figure 9.2. Extreme Heat Climate Indices in York Region, using Canadian Gridded Station Observation, CANGRD (Historical) and Ministry of the Environment and Climate Change (MOECC) Ensemble Median Values (Future).

Source: Fausto et al., Historical and Future Climate Trends in York Region (Toronto: Ontario Climate Consortium, 2015).

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The warming climate is helping vector-borne diseases to spread. 2017 was a record year for ticks in Ontario, which carry illnesses like Lyme disease and anaplasma. Other diseases currently confined to warmer climates, like the Zika virus, may one day reach Ontario as a result of warmer and wetter conditions in the province.

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Figure 9.3. Ontario Lyme Disease Map 2017 - Estimated Risk Areas.

Source: Ontario Agency for Health Protection and Promotion (Public Health Ontario), *Ontario Lyme Disease Estimated Risk Areas Map* (Toronto: Queen's Printer for Ontario, 2017). Note: This document was adapted with the permission of Public Health Ontario. Public Health Ontario assumes no responsibility for the content of any publication resulting from translation/changes/adaptation of PHO documents by third parties.



Photo credit: Creative Commons, CC0 1.0 Universal (CC0 1.0)

Hotter temperatures intensify the impacts from air pollution. They cause spikes in the concentration of some key pollutants (e.g., ozone and secondary particulate matter) by accelerating the reactions that form them. These pollutants can affect human lungs, causing:

- · Shortness of breath;
- · Painful breathing;
- Coughing;
- Throat irritation and respiratory tract inflammation; and
- Aggravation of pre-existing conditions, such as asthma and bronchitis.

The formation of ground-level ozone requires three key ingredients: nitrogen oxides (NO_x), volatile organic compounds (VOC), and sunlight. Because heat plays a role in increasing concentrations of ground-level ozone, outdoor air quality can be expected to worsen with high temperatures, especially on hot summer days without clouds.

Toronto's Medical Officer of Health reports that air pollution, primarily from motor vehicle traffic, contributes to 1,300 premature deaths and 3,550 hospitalizations in Toronto each year.² According to the Medical Officer of Health, People living close to roads are more likely to experience adverse health outcomes including breathing problems, heart disease, cancer and premature death.³

The health risk from traffic-related air pollution is highly localized, and therefore can be reduced by local action to minimize the use of internal combustion engines, which would also help reduce greenhouse gas emissions:

Emissions of traffic-related air pollution ... can be reduced with sustained focus on initiatives that promote active transportation and transit, reduce congestion, and encourage use of electric vehicles.⁴

For comparison, the C40 Cities Climate Leadership Group estimates that Paris's *Green & Healthy Streets Declaration* (a commitment to close the city to fossil fuel vehicles by 2030 and to procure only electric buses by 2025) will:

- Avoid an estimated 400 air quality related deaths per year;
- Add 21 days to average life expectancy for every resident of Paris; and
- Prevent an estimated 1,280 respiratory hospital admissions and 6,350 cardiovascular hospital admissions annually.⁵

In 2017, heat, droughts and wildfires, worsened by climate change, caused an unrelenting increase in dangerous spikes in particle pollution from dust and smoke in a number of American cities. More than 4 in 10 people suffered from poor air quality in these communities.⁶ Similar air quality impacts occurred in parts of western Canada, as British Columbia experienced its worst wildfire season on record. Ontario is equally susceptible to pollution from wildfires – see Section 9.1.

9.1 Forests

In 2016, the ECO reported on the risk of catastrophic fires in Ontario's forests. Even in the comparatively mild wet summer of 2017, more than 155 wild fires burned in northwestern Ontario. Despite expected increases in rainfall events, the overall trend toward warmer summers and longer periods of warm weather will bring a growing risk of wildfires in the province. Climate change also means more sudden, heavy rainfalls that result in runoff or evaporation, because the soil cannot absorb all the water; between rainfall events, forests continue to dry out. As illustrated by catastrophic fires in Canada, Chile, Portugal, California and elsewhere around the world in 2017, the growing risk of forest fires has significant environmental, health and social consequences for Ontario communities.



Smoke from the 2017 California forest fires affected large areas of North America, including Ontario.

Photo credit: U.S. National Oceanic and Atmospheric Administration.

A warmer climate also carries with it an increased risk of pest epidemics and diseases in Ontario's forests. For instance, climate change is expected to result in increased Spruce Budworm damage in northern areas of Ontario and decreased Spruce Budworm damage in more southerly areas. Changes in composition and productivity of forests will result in shifts to the distribution and abundance of many species, and could cause the local disappearance of vulnerable species due to less favourable conditions.

Increased disturbances as a result of climate change could have an impact on the carbon storage potential of Ontario's forests (see Chapter 4 of this report for discussion of forest carbon and Ontario's proposed offset program). Together with socio-economic impacts to the forest industry and those who rely on it, climate change is likely to have a significant cumulative effect on Ontario's forests.

9.2 Warmer Winters

Warmer winters are having an impact across the province.

Unseasonably warm temperatures are threatening the viability of ice roads in the north, which could weaken a lifeline to dozens of remote First Nation communities. From 2017 to 2018, the province is investing \$5.8 million to build and maintain winter roads.⁷ Overall, the cost of maintaining all-weather roads is likely to be much higher in years to come.

The thinning and loss of sea and lake ice has many impacts, including on the food web. Shorter, less reliable winters can affect First Nations' travel to hunting grounds as well as animal habitat, and can make it harder for northern communities to obtain and to preserve wild sources of food. For waterfront communities, loss of ice can exacerbate erosion, affecting safety and the habitability of some areas. Winter thaws and rain-on-snow events can damage vegetation, and create adverse conditions for grazing animals such as caribou. As climate change continues, melting permafrost in Ontario's northern communities is expected to have a significant effect on other infrastructure. Arctic Council research suggests that 20% of the top layer of permafrost could melt by 2040.⁸ This could warp roads and sink buildings, leading to the displacement of entire communities. Melting permafrost may also unlock significant amounts of methane into the atmosphere, further exacerbating climate change.

Farther south, warmer winters complicate winter maintenance of roads and other infrastructure. With more fluctuations above and below the freezing point, more salt is being used, increasing salt infiltration into aquifers. This is a particular concern in areas of the province that depend on groundwater for drinking, such as Waterloo Region. The ECO has also heard reports of more damage occurring to infrastructure, such as concrete spalling (cracking) in Thunder Bay where winter weather used to stay reliably below freezing.

Warmer winters are also altering economically important recreational activities in communities across the province. Less predictable snow cover hurts snow-based tourism. On Lake Simcoe, the season for ice fishing has decreased by one day each year since 1989.⁹



Figure 9.4. Decrease in duration of ice cover in Lake Simcoe from 1980-2012, as observed from Barrie.

Source: Government of Ontario, Minister's Five Year Report on Lake Simcoe: To protect and restore the ecological health of the Lake Simcoe watershed.



Photo credit: Ministry of Natural Resources and Forestry.



The Rideau Canal Skateway, which has been dubbed the world's largest skating rink, has been affected by variable temperatures and shorter winter seasons. In 2016, the skateway was open for 18 days, whereas typically, it would remain open from early January to March. In fact, in 1971-1972, the skating season was 90 days long. The skateway is economically and culturally important; it is estimated to bring in about a million visitors each year, and has become an iconic symbol of Canada's capital. Photo credit: Queen's Printer for Ontario.

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9.3 Agriculture and Food

Ontario's summers are getting hotter, and the hot weather is lasting longer as the climate heats up.¹⁰ This has significant implications for many sectors, including agriculture, forestry, and buildings.

Ontario's frost-free season is already increasing by 1-13 days each decade in areas across the province.¹¹ Different regions are warming at different rates. For instance, the Greater Toronto Area's frost-free season has increased by 3-4 days per decade over the past 36 years.¹² The frost-free season in northern portions of the province is increasing even faster: some areas have experienced increases of more than 10 days per decade over the same study period.¹³ In 2016, Thunder Bay saw the longest streak of frost-free days in recorded history, with a record 140 consecutive days without frost. Over the past decade, the frost-free season in Thunder Bay was closer to 99 days.



Figure 9.5. Frost-free season trend showing increase in frost-free days over a 10-year period.

Source: Laboratory of Mathematical Parallel Systems (LAMPS), York University.



Photo credit: Shutterstock.

Longer growing seasons can help agriculture, but unpredictability and invasive pests can be very hard on farmers. Wetter springs and faster melts have been coupled with increased summer drought,¹⁴ such as that experienced in 2016 across much of Ontario. Some of the regions hardest hit by droughts in 2016 were also damaged by heavy rains and flooding in the summer of 2017. A rainy spring delayed the planting of crops throughout many parts of the province, and wetter than normal conditions throughout the 2017 summer months led some farmers to lose hundreds of acres of crops.

Warmer winters can also cause challenges for specialty crops, such as the award-winning ice wine grapes in Ontario's wine growing regions. These grapes need a temperature of -8°C to be used for ice wine: grapes freeze at this temperature and can be used to produce sufficiently concentrated juice, which is what distinguishes an ice wine from other wine types. The unpredictable and fluctuating weather experienced in the past several winters has wreaked havoc.



Flooding in Foxboro, Ontario. Photo credit: Associated Press.

9.4 Storms and Flooding

Increased extremes in temperature and precipitation also mean increased risk of flooding in communities across the province. Overall, a warmer climate is expected to lead to increased localized rainfalls and extreme storms,¹⁵ which could have particularly serious consequences in urban areas. The Toronto floods in 2013, the 2014 floods in Burlington and parts of eastern Ontario, and those experienced on the Toronto Islands, in Windsor, in Cambridge, in Minden and in the Ottawa-Gatineau region in 2017, are all the types of events that climate change makes more likely. The socio-economic costs of these floods are significant: for example, the 2013 flooding that affected portions of Toronto resulted in more than \$940 million in damages.¹⁶ While official figures are not yet available for the floods that occurred in 2017, the number is likely to be in the tens of millions, if not higher.¹⁷

9.5 Conclusion

Climate change isn't just about polar bears, or about other people in other places in the future. Ontario is already feeling the first effects of climate change, and much bigger changes are ahead.



Endnotes

- 1. Medical Officer of Health, "Report for Action: Reducing Vulnerability to Extreme Heat in the Community and at Home" (May 3, 2017).
- Medical Officer of Health and Deputy City Manager, Internal Corporate Services, "Report for Action: Reducing Health Risks from Traffic-Related Air Pollution (TRAP) in Toronto" (October 16, 2017) at 1, online: <u>https:// www.toronto.ca/legdocs/mmis/2017/pe/bgrd/backgroundfile-108665.</u> pdf. [Accessed December 13, 2017]
- Medical Officer of Health and Deputy City Manager, Internal Corporate Services, "Report for Action: Reducing Health Risks from Traffic-Related Air Pollution (TRAP) in Toronto" (October 16, 2017) at 1, online: <u>https:// www.toronto.ca/legdocs/mmis/2017/pe/bgrd/backgroundfile-108665.</u> pdf. [Accessed December 13, 2017]
- Medical Officer of Health and Deputy City Manager, Internal Corporate Services, "Report for Action: Reducing Health Risks from Traffic-Related Air Pollution (TRAP) in Toronto" (October 16, 2017) at 1, online: <u>https:// www.toronto.ca/legdocs/mmis/2017/pe/bgrd/backgroundfile-108665.</u> pdf. [Accessed December 13, 2017]
- C40 Cities Climate Leadership Group, "Appendix: Summary Results & Methodology" online: <u>https://c40-production-images.s3.amazonaws.</u> <u>com/other_uploads/images/1538_APPENDIX - Summary_results_and_methodology.original.pdf?1512993064.</u> [Accessed December 15, 2017]
- American Lung Association, State of the Air 2017 (Chicago: American Lung Association, 2017) at 4, online: <u>http://www.lung.org/assets/ documents/healthy-air/state-of-the-air/state-of-the-air-2017.pdf</u>. [Accessed December 13, 2017]
- 7. Ministry of Northern Development and Mines, "Northern Ontario Winter Roads", online: https://www.mndm.gov.on.ca/en/northern-development/ transportation-support/northern-ontario-winter-roads.
- Arctic Monitoring and Assessment Programme, "Snow, Water, Ice, Permafrost in the Arctic" (2017), online: <u>http://www.amap.no/swipa</u>. [Accessed November 27, 2017]
- Ontario Ministry of the Environment and Climate Change, Minister's Five Year Report on Lake Simcoe: To Protect and Restore the Ecological Health of the Lake Simcoe Watershed (2015), online: <u>https://www.ontario.ca/page/ministers-five-year-report-lake-simcoe-protect-and-restore-ecological-health-lake-simcoe-watershed</u>. [Accessed December 19, 2017]
- Ontario, "Climate Ready: Adaptation Strategy and Action Plan 2011-2014" online: <u>https://www.ontario.ca/document/climate-ready-adaptation-strategy-and-action-plan-2011-2014-0</u>. [Accessed November 28, 2017]
- 11. Laboratory of Mathematical Parallel Systems (LAMPS), York University, "Ontario Frost-Free Season (FFS) Change Projection" (2017).
- 12. ibid.
- 13. ibid.
- Ontario, "Climate Ready: Adaptation Strategy and Action Plan 2011-2014" online: <u>https://www.ontario.ca/document/climate-ready-adaptation-strategy-and-action-plan-2011-2014-0</u>. [Accessed November 28, 2017]

- Canada-Ontario Agreement Partners, "Partnering in Phosphorus Control: Achieving Phosphorus Reductions in Lake Erie from Canadian Sources" (February 2017), online: <u>http://www.downloads.ene.gov.on.ca/envision/env_reg/er/documents/2017/012-9971%20ENG.pdf</u>. [Accessed November 29, 2017]
- Insurance Bureau of Canada, "Canada inundated by severe weather in 2013: Insurance companies pay out record-breaking \$3.2 billion to policyholders" (2014), online: IBC http://www.ibc.ca/yt/resources/ media-centre/media-releases/canada-inundated-by-severe-weather-in-2013-insurance-companies-pay-out-record-breaking-\$3-2-billion-topolicyholders. [Accessed December 19, 2017]
- Amanda Pfeffer, "Quebec says \$6.5M for Gatineau flood claimants in mail next week" (October 7, 2017), online: CBC News <u>http://www.cbc. ca/news/canada/ottawa/quebec-gatineau-flood-claims-1.4344571</u>. [Accessed December 19, 2017]

Chapter 10 Talking With Ontarians About Climate Change



Abstract

10

The Environmental Commissioner and her staff spend a lot of time talking with thousands of Ontarians about the urgency of climate change, what each of us can do about it, and what we owe to the young people we care about.

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266 Ontario's Climate Act From Plan to Progress



Young people won't have what we had. Photo Credit: Dianne Saxe, Environmental Commissioner of Ontario.

10.0 ECO Outreach

The Commissioner travelled the province, giving over 120 presentations to a wide range of audiences, including municipalities, faith communities, pension fund managers, educators, industry and environmental groups, other Legislative Officers, the Ontario Municipal Board, the Ontario Energy Board, senior decision makers from all Ontario ministries, the Ontario Securities Commission and the Financial Services Commission of Ontario. The Commissioner also met MPPs from all political parties.

The Commissioner's visits to numerous communities across the province provided an invaluable opportunity for community groups to learn about our work and to share their insights directly with the Commissioner. Figure 10.1 is a map showing some of the locations where the Commissioner met Ontario citizens in 2017.



Figure 10.1. The Environmental Commissioner made over 120 climate change presentations across Ontario in 2017. Photo credit: Environmental Commissioner of Ontario (2017); Clifton Li (2017). To reach other Ontarians, we held two webinars to present our 2016 report on greenhouse gases, *Facing Climate Change*. The first webinar focused on the science of climate change, and on Ontario's emissions. The second webinar explained Ontario's cap and trade program and how the government planned to spend cap and trade revenues. These were exceptionally well attended. These webinars remain accessible on our website and have been watched nearly 700 times on our YouTube channel.

10.1 Climate Science

Chapter 1 of *Facing Climate Change* summarized the basic science of climate change. Our presentations showed how stark the situation is, how rapidly it is deteriorating, and why it is so critical to take strong action now. Here are few of the key graphs from those presentations, updated where possible to November 2017. To see an earlier version of this presentation, go to Facing Climate Change Part 1 on our YouTube channel.

Climate change is primarily driven by increased greenhouse gases (GHGs) that humans emit into the atmosphere. The amount of GHGs that humans release has increased virtually every year since the Industrial Revolution and is now at record levels (Figure 10.2). The most common GHG produced by humans is carbon dioxide (CO_2), mostly from fossil fuels. The amount of CO_2 that humans emit has grown especially quickly since 1992, when the governments of the world recognized the urgency of climate change and signed the United Nations Framework Convention on Climate Change.



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Figure 10.2. Highest ever global CO₂ emissions. Source: Global Carbon Project, *Carbon Budget* (2017).

As a result, GHGs in the atmosphere are higher than they have ever been in human history.

For hundreds of thousands of years, through every conceivable natural cycle, including volcanoes and ice ages, CO_2 in the atmosphere varied between 180 and 280 parts per million (ppm). In 1988 the planet passed 350 ppm, which is the scientific consensus as to the highest level of CO_2 that the atmosphere can hold for long and still give us the kind of climate that baby boomers grew up with, the kind of climate that our society is designed for.

The first time in human history when CO_2 in the atmosphere exceeded 410 ppm was 2017 (Figure 10.3). The atmospheric concentration of CO_2 is now reliably above 400 ppm, and is rising ever more steeply. We are now in completely uncharted territory. It will take about a generation before humans start to really experience what that means.

WE ARE NOW IN COMPLETELY UNCHARTED TERRITORY



Figure 10.3. Highest CO₂ concentrations.

Source: National Oceanic and Atmospheric Administration, Trends in Atmospheric Carbon Dioxide at Mauna Loa Observatory (full record), (2016).

As CO_2 and other GHGs build up in the atmosphere, they are trapping more and more heat (Figure 10.4). Most of the heat is being trapped by CO_2 , methane, nitrous oxide and refrigerants (such as CFCs).



Figure 10.4. CO_2 is not the only greenhouse gas responsible for climate change.

Source: National Oceanic and Atmospheric Administration, *The NOAA Annual Greenhouse Gas Index* (2016).

As a result, average global temperatures (Figure 10.5) and sea levels are rising. Both cause significant environmental and economic disruption.



Figure 10.5. 2016 had the highest average temperatures in human history.

Source: National Oceanic and Atmospheric Administration, Land and Ocean Temperature Percentiles 2016 (2017).

Most of the heat has gone into the ocean, making the water expand and melting ice from below (Figure 10.6).





Source: Intergovernmental Panel on Climate Change, *Chapter 3: Observations: Oceans in Climate Change 2013: The Physical Science Basis* (contribution of Working Group 1 to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change) (2013).

Only 1% of the extra heat is in the air, where people tend to notice it. Air temperatures do not go up smoothly, as CO_2 levels do (Figure 10.7), because the extra heat from GHGs is just one factor affecting a very complex climate system, with its own natural cycles and variability.



Figure 10.7. Only 1% of the heat in the air.

Source: National Aeronautics and Space Administration, *Earth Observatory:* 2010 Features – Global Warming (2010).

EXTRA HEAT CHANGES AVERAGE TEMPERATURES, BUT SO FAR ITS GREATEST IMPACT IS ON EXTREME EVENTS

Extra heat changes average temperatures, but so far its greatest impact is on extreme events. Like drinking alcohol before driving, extra heat makes extreme events more likely. As a result, loss and damage are spreading, from heat, wildfires, hurricanes and floods; human health is increasingly at risk.



Photo Credit: Cooperative Institute for Research in the Atmosphere, Regional and Mesoscale Meteorology Branch (2017).

As more data is gathered and analysed, scientists are better able to identify the fingerprints of human-caused climate change in specific disasters. For example, higher air and water temperatures made six times more likely

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the heavy rains that caused so much damage during Hurricane Harvey. Even in Canada, catastrophic weather events are driving up insured losses (Figure 10.8).



Figure 10.8. Catastrophic insured losses in Canada.

Source: Insurance Bureau of Canada, Lapo Calamai (2016).

GHGs and the extra heat they trap, are not the only force causing disasters and disruption; the natural cycles that have always affected our weather continue to do so. But human-caused GHGs are trapping far more heat than all the natural cycles put together (Figure 10.9).





Source: National Oceanic and Atmospheric Administration, U.S. Global Change Research Program, *Climate Science Special Report* (2017).



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MANY ONTARIANS ARE STILL WAITING AND HOPING FOR "NORMAL" WEATHER TO COME BACK. BUT "NORMAL" CANNOT COME BACK

Many Ontarians are still waiting and hoping for "normal" weather to come back. But "normal," in the sense of the average temperatures of the 20th century, cannot come back. Temperature anomalies (warmer than "expected" temperatures) are increasing globally (Figure 10.10), and much more warming is already "locked in" by the GHGs already in the atmosphere.



Figure 10.10. 20th century "normal" is gone.

Source: National Oceanic and Atmospheric Administration (2017).

Already, the natural world is starting to reach tipping points. Last winter, world sea ice coverage hit extraordinary lows. The red line at the bottom of Figure 10.11, which represents 2017, broke the seasonal pattern of sea ice coverage for the first time since measurements began.





The even more extraordinarily warm Antarctic water in 2017 means that the collapse of the West Antarctic Ice Sheet is now almost inevitable. This will mean much higher sea levels. To those willing to hear, the drum beat of climate weirding is now deafeningly loud.

Of course, climate change will bring opportunities as well as risks. Most of us in Ontario are likely to be comparatively lucky – far from the rising seas and from the heat of the equator, with a large supply of fresh water. Already, growing seasons are longer in most parts of the province, increasing more than 10 days per decade in some places.

IS IT TOO LATE FOR YOU TO MAKE A DIFFERENCE? ABSOLUTELY NOT



Innovation, renewable energy and conservation provide a pathway to a province with cleaner air and higher employment. And milder winters will mean that most of us will require less energy for heating.

Still, challenging changes are already occurring in Ontario. Even Ontarians can no longer expect to have, unchanged, both the energy economy that has made so many prosperous and comfortable, and the climate upon which which that economy, as well as our health and ecosystems, depend. And if Ontarians escape most of the suffering experienced in other places, others will not be so fortunate. What happens to them will affect us in many ways, direct and indirect, including through supply chains, trade and migration.

When audiences ask, "Is it too late?" the Commissioner always responds, "Too late for what? Is it too late for our young people to have the same world and the same choices that I grew up with? Yes. Is it too late for Canada to avoid big, disruptive, difficult changes? Yes. Is it too late for you to make a difference? Absolutely not." The need for action has never been more urgent.

10.2 Ontario Is Doing So Much Right

The Commissioner also helps audiences to understand what Ontario is doing to respond to climate change (Figure 10.12), including the cap and trade system that began to operate January 1, 2017. Here are some key slides on the topics covered in Facing Climate Change Part 2 on our YouTube channel.

Coal power plant closures

Price on carbon

Action Plan

Starting on adaptation

Figure 10.12. Ontario is doing so much right.

Source: Environmental Commissioner of Ontario.

Ontario successfully reduced its GHG emissions 6% below 1990 levels by 2014, mostly by closing the coal power plants (Figure 10.13). Without more government action, emissions would rise again.



Figure 10.13. Still a long way to go.

The cap and trade program and the *Climate Change Action Plan* are intended to help meet Ontario's 2020, 2030 and 2050 emissions-reduction targets (Figure 10.14).



Figure 10.14. Ontario's new Climate Act includes emissions-reduction targets for 2020, 2030 and 2050.

Source: Environmental Commissioner of Ontario.

TO REDUCE GHG EMISSIONS, WE MUST PUT A PRICE ON THEM

To reduce GHG emissions, we must put a price on them. GHG polluters would emit less if they had to pay for the privilege (Figure 10.15).



Figure 10.15. Basic theory – polluter pays. Source: EarthFix, Carbon Pricing, *Explained with Chickens* (2016).

The cap and trade program requires capped emitters to acquire allowances for their emissions. Large final emitters need their own allowances. Fuel providers must acquire allowances on behalf of their customers (Figure 10.16).

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Figure 10.16. Who needs allowances?

Source: Environmental Commissioner of Ontario.

The cap is based on the number of available allowances. The number of allowances available declines over time. Decreasing availability should increase the value, and thus the price, of allowances (Figure 10.17). Higher prices should incent emitters to reduce their emissions. Allowances Over Time



Figure 10.17. The cap reduces the availability of carbon emission allowances over time, leading to higher carbon prices.

Most allowances are acquired from the government via auctions. Major industries get some of their allowances free so they can compete with competitors outside Ontario who don't pay carbon prices (Figure 10.18).



Figure 10.18. Who pays, who doesn't?

Source: Environmental Commissioner of Ontario.

Emitters can trade emission allowances amongst themselves. Those with more allowances than emissions can sell excess allowances to others (Figure 10.19). This means even emitters with free allowances also have a financial incentive to reduce their emissions. The flexibility this system provides allows the most cost-effective emissions reductions to be achieved first, regardless of where the emissions reductions occur.



Figure 10.19. Emission allowance trading allows those with more allowances than emissions to sell excess allowances to others.

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Not all emitters are capped. Emissions from agricultural processes and waste do not require allowances. Instead, the cap and trade system incentivizes uncapped emissions to be reduced with an offset program (Figure 10.20). Uncapped emissions can be reduced to create offset credits. These credits can be used in lieu of allowances, to offset the emissions by capped emitters. Offset credits can be earned by projects both inside and outside Ontario.



Source: Environmental Commissioner of Ontario.

What will the province do with the auction revenue? Cap and trade program proceeds from emission allowance auctions are held in the Greenhouse Gas Reduction Account (Figure 10.21). These proceeds are legally required to be used to reduce or support the reduction of GHG emissions. The government outlined its plan for this money in the *Climate Change Action Plan*.



Figure 10.21. Spending the auction revenue.

Climate change mitigation and adaptation cannot be left entirely up to government. No one can do everything, but everyone can do something. Ontarians must reduce their carbon footprint, get ready to adapt and speak up. It's not too late.

> What should Ontario do next?

> > And what can I do?

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Knowledge + Action = Hope

No one can do everything, but everyone can do something.

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Recommendations

Summary of Recommendations From the ECO's 2017 Greenhouse Gas Progress Report

The National and International Context for Ontario's Climate Policy (Chapter 3)

The government should work with California and Quebec to reduce the oversupply of allowances, and to adjust future caps and allowance supply as needed to meet GHG-reduction targets.

Carbon Offsets (Chapter 4)

To maximize the co-benefits for Ontarians, the government should, whenever practical, purchase its voluntary offset credits from Ontario-based projects.

To ensure the credibility of California-registered offset credits used by Ontario emitters, the government should ask the California Air Resources Board to demonstrate the science behind the discount rates used in California's offset protocols.

The government should only authorize compliance offset protocols that will result in emissions reductions that are real, quantifiable, additional, permanent, verifiable, and assessed for leakage. Even though Ontario emitters are entitled to buy and use offset credits recognized by California and Quebec, Ontario should not simply mimic offset protocols from those jurisdictions. Where California or Quebec has accepted offset protocols that do not meet key regulatory criteria, Ontario should work with its partner jurisdictions to "level up" the protocols in all three jurisdictions. The ECO makes the following recommendations with respect to the development of compliance offset protocols:

Proposed Offset Protocol	Rating and Recommendation
	Move Forward
	Proceed With Caution
	Do Not Move Forward
	? Not Enough Known
Landfill gas capture and destruction	
Mine methane capture and destruction	
Ozone depleting substances capture and destruction	
Refrigeration systems	
Conservation cropping	
Nitrous oxide reductions from	
fertilizer management in agriculture	
Emissions reductions from livestock	?
Grassland projects	
Anaerobic digestion	
Organic waste management	
Forest management	
Afforestation and reforestation	
Urban forest projects	

Spending From the Greenhouse Gas Reduction Account (Chapter 5)

Each ministry and sector should have an explicit and steadily declining carbon budget tied to Ontario's climate targets, and should transparently account to the public for how they use the Greenhouse Gas Reduction Account and other government funds to achieve it.

This accounting should, at least for major expenditures, include a comprehensive assessment of the impact of each initiative on the public interest, including GHG reductions, cost effectiveness, impacts on low-income and vulnerable communities, and environmental, economic and health effects.

Freight Trucks (Chapter 6)

The government should prioritize road pricing and complementary investments to reduce traffic, instead of new highway construction, which increases traffic.

The government should allow municipalities to charge for the use of their roads.

The government should phase out diesel truck retrofit subsidies as they become redundant due to federal policies.

The government should fund initiatives designed to take older, less efficient diesel trucks off the road.

The government should not subsidize fossil natural gas trucking with cap and trade revenues.

The government should support only those renewable natural gas trucking projects that do not have a pipeline connection.

Taking Climate Change Seriously Across Government (Chapter 7)

Where proposed regulations may have significant impacts on Ontario-wide GHG emissions, (e.g., >10,000 t CO_2e/yr), all ministries should post regulatory impact statements on the Environmental Registry showing a cost-benefit analysis that includes a social cost of carbon, estimated consistently across ministries.

To achieve carbon neutrality, the government should offset the GHG emissions for which it is directly and indirectly responsible.

Low-Carbon Procurement (Chapter 8)

The government should:

- Insist on the disclosure of the total GHG footprint of each product or project subject to procurement, specifically where the procurement categories are known to be GHG intensive;
- Give that footprint significant weight in procurement decisions;
- Set a specific emissions-reduction target for procurement; and
- Report annually on the effectiveness of low-carbon procurement initiatives.

Climate progress around the world in 2017 provided inspiration and signs of hope



'Spectacular' drop in renewable energy costs leads to record global boost The Guardian



Why people are marching for science: 'There is no Planet B' Washington Post



China fossil fuel deadline shifts focus to electric car race Bloomberg



Banks and insurers support task force recommendations on climate-related financial disclosure Forbes



U.S. cities and companies declare 'we are still in' Paris Agreement Independent



Spike in number of Canadians cycling, taking public transit to work Globe and Mail



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