Chapter 4
Carbon Offsets

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.

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.
Contents

4.0 Who Needs Offsets? We All Do 108

4.1 What Are Offsets? 109

4.2 Why Include Offsets in Ontario’s Cap and Trade Program? 110
  4.2.1 Offsets Can Reduce Costs for Capped Emitters 110
  4.2.2 Offsets Can Expand the Reach of Cap and Trade 111
  4.2.3 Offset Projects Can Produce Environmental and Socio-Economic Co-Benefits 112
  4.2.4 Helping Rural and Remote Communities 113

4.3 Are Offsets Legitimate Reduction Tools? 115

4.4 What Are the Key Concerns? 115
  4.4.1 Concerns About Climate Integrity 115
  4.4.2 Social, Economic, and Ecological Concerns 120

4.5 Ontario’s Proposed Offset Program 122

4.6 Ontario’s Offset Rules 123
  4.6.1 Overview of Protocols 123
  4.6.2 A Closer Look at Ontario’s Proposed Protocols 125
  4.6.3 Methane Capture Projects 125
  4.6.4 Ozone Depleting Substances and Refrigeration Systems Projects 128
  4.6.5 Agricultural and Grassland Projects 131
  4.6.6 Anaerobic Digestion and Organic Waste Management Projects 138
  4.6.7 Forest Projects 141
  4.6.8 Urban Forest Projects 150

4.7 Conclusions and Recommendations 151
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. 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.

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 projects 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 plants 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 (CO₂e) 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.

**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. 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 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.

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 emissions and 69% of the province’s nitrous oxide emissions. Even in small amounts, these gases do outsized climate damage.

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.

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.
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.
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. 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.

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, and are often less expensive. 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. 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.


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 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.

Because of the potential for local ecological and socioeconomic benefits, the ECO believes that the Ontario government should prioritize the purchase of Ontario-based 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.

To maximize the co-benefits for Ontarians, the government should, whenever practical, purchase its voluntary offset credits from Ontario-based projects.
4.3 Are Offsets Legitimate Reduction Tools?

Offsets have been studied extensively over the past twenty or so years. 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.

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:

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 methane-capture 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). 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.

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%).

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. 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. 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.

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.
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).

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.

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

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. 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

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.

Double Counting

Double counting refers to counting the same emissions reductions twice. 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. 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. Villagers’ crops were destroyed, and shots were allegedly fired at those attempting to access the areas allotted for offsetting.

**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. 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.29

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.

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.
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.
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.

9. 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

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.

<table>
<thead>
<tr>
<th>Offset Project Category</th>
<th>Offset Protocol</th>
<th>General Project Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methane capture projects</td>
<td>Landfill gas capture and destruction</td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td>Mine methane capture and destruction</td>
<td>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.</td>
</tr>
<tr>
<td>Ozone depleting substances (ODS) and refrigeration systems projects</td>
<td>Ozone depleting substances capture and destruction</td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td>Refrigeration systems</td>
<td>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.</td>
</tr>
<tr>
<td>Agricultural and grassland projects</td>
<td>Conservation cropping</td>
<td>Implementation of direct seeding and minimal tillage farm practices to sequester GHG emissions in agricultural soils.</td>
</tr>
<tr>
<td></td>
<td>Nitrous oxide reductions from fertilizer management in agriculture</td>
<td>Reduction in N₂O emissions due to changes in nitrogen fertilizer application practices, including rate, source, time and placement compared to baseline application rates at the project site.</td>
</tr>
<tr>
<td></td>
<td>Emissions reductions from livestock</td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td>Grassland projects</td>
<td>Avoided conversion of natural grasslands and pasturelands to cropland to decrease soil carbon loss.</td>
</tr>
<tr>
<td>Anaerobic digestion and organic waste management projects</td>
<td>Anaerobic digestion</td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td>Organic waste management</td>
<td>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.</td>
</tr>
<tr>
<td>Forest projects</td>
<td>Forest management</td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td>Afforestation and reforestation</td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td>Urban forest projects</td>
<td>Tree planting and maintenance activities to increase carbon storage in urban trees, including projects by municipalities, utilities, educational institutions, and other organizations.</td>
</tr>
</tbody>
</table>
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. 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. 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). 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.

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 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. 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.

**RATING:**

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.

---

**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. The project is additional because New Brunswick does not mandate methane capture at this landfill.
Mine Methane Capture and Destruction

Methane released from coal mines accounts for about 8% of global anthropogenic methane emissions.\textsuperscript{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.\textsuperscript{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.

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.\textsuperscript{41} The Air Resources Board study concluded that offset project returns were not sufficient to influence coal production decisions.

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

4.6.4 Ozone Depleting Substances and Refrigeration Systems Projects

**Ozone Depleting Substances Capture and Destruction**

Ozone depleting substances (ODS) are human-produced 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 CO₂ over a 100-year timeframe, while HCFCs are anywhere from 79 to 1,980 times more powerful. 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. 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. 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.

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. 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. However, HFCs come with a significant climate price tag: HFCs have up to 12,400 times greater capacity to warm the atmosphere than CO₂ on a 100-year time scale, and are in wide use around the world. This means that reducing HFCs is extremely important to reduce near-term global warming.

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 CO₂. 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.

**RATING:**

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 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). 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.

More than 93 million acres of Canadian land are currently devoted to crops. 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 ECO HAS SERIOUS CONCERNS ABOUT THE PERMANENCE OF CARBON SEQUESTRATION FROM CONSERVATION CROPPING

Photo credit: Shutterstock, 2018.
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 practices 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. 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 year (although this amount could be much lower or much higher). 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. 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 socio-economic 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 N₂O – 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. This increase resulted in a 190% jump in emissions of CO₂ from urea-based carbon-containing fertilizers in the same period.

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.

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.
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 CO$_2$e per year, the equivalent of taking 568,000 cars off the road,\textsuperscript{59} or more.\textsuperscript{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,\textsuperscript{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.
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

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 CO₂ 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. 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. 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. 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.
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. 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: A “Garden of Rarities”

Tallgrass prairies used to cover 23% of North America, but today, less than 0.2% of North America’s original tallgrass prairie ecosystem remains intact. 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.

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. 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. 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. 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.

Additionality risks are likely to be low with these types of projects, as long as proper safeguards are in place. Issues around permanence and leakage are unlikely to arise with respect to anaerobic digestion projects, and for those who decide to participate under the anaerobic digestion protocol, projects can carry a number of socio-economic co-benefits. Participants in the program would not only have access to a new source of revenue from offset credits, but could gain further revenue or savings from the sale or use of the biogas product generated through digestion. This could help 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 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. 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 CO₂e in emissions could be avoided by 2030, with that number potentially rising to 2,300 Mt CO₂e by 2050.

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.

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...
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, 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. With a changing climate, forest loss due to fire is expected to at least double by the end of this century.

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. 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.

**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.

<table>
<thead>
<tr>
<th>Considerations for forest offset GHG mitigation potential</th>
<th>Offset project that decreases wood harvest in a particular forest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon sequestered in forest</td>
<td>More carbon storage</td>
</tr>
<tr>
<td>Carbon sequestered in wood products from that forest</td>
<td>Less carbon storage and landfill methane emissions</td>
</tr>
<tr>
<td>Product life cycle emissions</td>
<td>Less emissions</td>
</tr>
</tbody>
</table>

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. 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.” 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%.

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?

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%.

Leakage has been estimated at 41-43% in the Northeast U.S. and 8-16% for the Pacific Northwest U.S., based on a model that considers only the leakage taking place within the continental United States. Leakage estimates increase considerably when a broader geographic scope is used. For example, other research reviewed by the IPCC showed leakage increasing from 58% to 84% when the scope included Canada as well as the continental United States. 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.

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.

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:

1. current forest protocols do not track the individual carbon-storing wood products generated by each offset project for any period, much less 100 years;
2. the models used to predict wood product decomposition rates use highly uncertain assumptions (see Ontario example in endnote);¹⁰¹
3. 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.
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). 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:

1. 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 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. For example, the broad categorization of Ontario forests as uniformly young, middle-aged or old (as in the MNRF’s forest carbon discussion paper) is problematic, as many Ontario forests are not even-aged and have relatively long fire cycles (over 100 years).

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.

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.
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. 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.

RATING: •

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: •
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;
- increase recreational opportunities;
- provide more plant and wildlife habitat;
- improve aesthetic and intrinsic value;
- reduce air pollution (O\textsubscript{3}, NO\textsubscript{x}, SO\textsubscript{2}, PM);
- draw up storm-water to reduce runoff.

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

Photo credit: Creative Commons, CC0 1.0 Universal (CC0 1.0).
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 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 socio-economic co-benefits, and the relatively low regulatory risks associated with urban forest projects, the ECO supports including them in Ontario’s offset program.
• 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:

<table>
<thead>
<tr>
<th>Proposed Offset Protocol</th>
<th>Rating</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landfill gas capture and destruction</td>
<td>☢️</td>
<td>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.</td>
</tr>
<tr>
<td>Mine methane capture and destruction</td>
<td>🟢</td>
<td>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.</td>
</tr>
<tr>
<td>Ozone depleting substances capture and destruction</td>
<td>☢️</td>
<td>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.</td>
</tr>
<tr>
<td>Refrigeration systems</td>
<td>☢️</td>
<td>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.</td>
</tr>
<tr>
<td>Conservation cropping</td>
<td>🟠️</td>
<td>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.</td>
</tr>
<tr>
<td>Nitrous oxide reductions from fertilizer management in agriculture</td>
<td>☢️</td>
<td>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).</td>
</tr>
<tr>
<td>Category</td>
<td>Recommendation</td>
<td></td>
</tr>
<tr>
<td>----------------------------------------------</td>
<td>----------------</td>
<td></td>
</tr>
<tr>
<td>Emissions reductions from livestock</td>
<td>?</td>
<td></td>
</tr>
<tr>
<td>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.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grassland projects</td>
<td>°</td>
<td></td>
</tr>
<tr>
<td>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.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anaerobic digestion</td>
<td>°</td>
<td></td>
</tr>
<tr>
<td>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.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organic waste management</td>
<td>°</td>
<td></td>
</tr>
<tr>
<td>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.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Forest management</td>
<td>°</td>
<td></td>
</tr>
<tr>
<td>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.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Afforestation and reforestation</td>
<td>°</td>
<td></td>
</tr>
<tr>
<td>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.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urban forest projects</td>
<td>°</td>
<td></td>
</tr>
<tr>
<td>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.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Endnotes

1. 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.

2. 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.


7. 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.


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.


12. In the same way, the ECO purchases 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](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.

16. Another component of the CDM additionality analysis is called a “barrier test,” which considers non-financial barriers to adoption of emissions-reduction technology and practice.


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: [https://www.sei-international.org/mediamanager/documents/Publications/Climate/SEI-WP-2015-07-Il-lessons-for-carbon-mechs.pdf](https://www.sei-international.org/mediamanager/documents/Publications/Climate/SEI-WP-2015-07-Il-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 (Ibid).


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.


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.


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 Aamjiwnaang, 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: https://un.org/wp-content/uploads/2016/06/WESS_2016_Report.pdf [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 “co-pollutants” 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 in-state 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: http://calbudgetcenter.org/wp-content/uploads/Policy-Insights-2017-Wander.pdf [Accessed November 10, 2017]


30. 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.

31. 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 landfills 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).


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 [http://www.owma.org/articles/owma-highlights-missed-opportunity-on-landfill-gas-offset-protocol]. [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).


40. 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]


43. According to Environment and Climate Change Canada, the Regulations: • Implement the phase-out schedule for consumption and production of HFCFs in accordance with the Montreal Protocol; • Create a manufacturing allowance system to phase out HFCF manufacturing in Canada; • Prohibit the import and manufacture of HFCFs to be used as fire-extinguishing agents after January 1, 2020; and • Establish a permitting and reporting system to monitor the import, manufacture and export of HFCs.


46. HFCs do not contain chlorine, so their ozone-depleting potential is zero.


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 http://www.drawdown.org/solutions/food/nutrient-management [Accessed November 10, 2017]).


73. Ibid at 4:03.


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).


89. Natural Resources Canada, The State of Canada's Forests: Annual Report 2016 (2017) at 6, online: http://crs.nrcan.gc.ca/pubwarehouse/pdfs/37285.pdf. [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.

91. 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.

92. 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).


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).


99. This leakage was associated with the reduction of timber supplies.


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).


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) 6 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.


111. DA Etheridge and GJ Kayahara, “Challenges and implications of incorporating multi-cohort management in southeastern 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.”


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.