
REPORT OF THE
**Expert Advisory
Council *to the*
Minister of
Sustainable
Development**

A Carbon Savings Account
for Manitoba
JUNE 2019

List of Abbreviations

4R	Right Source @ Right Rate, Right Time, Right Place®
Act	The Climate and Green Plan Implementation Act
BAU	Business-as-usual
BMP	Beneficial management practices
CER	Cumulative emissions reduction
CGPIO	Climate and Green Plan Implementation Office
CO ₂ e	Carbon dioxide equivalent
CSA	Carbon savings account
DSM	Demand-side management
EAC	Expert Advisory Council
ECCC	Environment and Climate Change Canada
EITE	Emissions-intensive trade-exposed
EPR	Extended Producer Responsibility
EV	Electric vehicle
GDP	Gross domestic product
GHG	Greenhouse gas
GOM	Government of Manitoba
GRE	Government of Manitoba Reporting Entities
HDV	Heavy-duty vehicle
HVAC	Heating, ventilation and air conditioning
IISD	International Institute for Sustainable Development
IPCC	Intergovernmental Panel on Climate Change
Kt	Kilotonnes
LDV	Light-duty vehicle
LULUCF	Land Use, land use change, and forestry
Mt	Megatonnes
MUSH	Municipalities, Universities, Schools, and Hospitals
NECB	National Energy Code for Buildings
NIR	National Inventory Report
SBVCTC	Small Business Venture Capital Tax Credit
SWG	Sector working groups
t	Tonnes
ZEV	Zero emission vehicle

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Letter to the Minister of Sustainable Development

Dear Minister,

Please find the first advisory report of the Expert Advisory Council (EAC) established under Section 7 of *The Climate and Green Plan Implementation Act* (the Act).

This report contains our recommendations and advice to you on establishing Manitoba's first carbon savings account (CSA), pursuant to Section 3 of the Act, setting out a Made-in-Manitoba GHG reduction goal with a series of measures that will result in tangible, measurable carbon emissions reductions for the province's first five-year carbon savings account period of 2018-2022.

Given what we have heard from Sector Working Groups and government advisers and from our knowledge of the subject matter, we believe that these actions are realistic and ready and will start the journey toward our end goal of being the cleanest, greenest and most climate resilient province in Canada.

Our independent advice has been arrived at after detailed consideration of how best to create a CSA for Manitoba that results in effective short and longer-term greenhouse gas emissions reductions. Our recommendations have been informed by data, analysis, and modelling work provided by both the federal and Manitoba governments, national and international experts in the field of carbon emissions, plus extensive stakeholder engagement with over 100 Manitoba participants representing a large cross-section of provincial industrial, business, environmental, community, and civil society organizations.

It is based, first and foremost, on a series of principles we set out in this report.

Our goal has been to establish a durable, workable approach to carbon emissions reductions that 'bends the carbon curve' once and for all, ensuring Manitoba emissions decline over time. We have sought to change the debate from 'something should be done' to 'this can be done' by providing a clear, action-oriented pathway to reduce emissions in a reasonable, realistic way while accounting for economic growth.

To do so, a strong foundational mechanism to set a clear emissions reduction goal, include specific actions that reduce emissions, and measure and adjust our progress as we go along is essential. That is what this report recommends.

Our recommended CSA is feasible. It will work. It sets out a made-in-Manitoba GHG emissions reduction goal with a series of recommended emissions reduction measures that will result in tangible, measurable carbon emissions reductions for the first five-year carbon savings account period of 2018-2022.

This advice is just the first step in establishing Manitoba's first CSA. More work lies ahead. The carbon savings account must be dynamic and flexible to incorporate updated emission forecasts and innovative actions as we go along. We need to learn, adjust, and improve. Standing still is not an option.

The EAC strongly believes Manitoba must play its part to help Canada – and the world – achieve GHG emissions reductions to help tackle climate change. Manitoba's emissions may be small compared to most, but our contribution to reduce them can be large. Establishing Canada's first-ever carbon savings account is a true leadership step.

We recommend the government adopt the proposed carbon savings account and associated actions, and consider the accompanying advice, as set out in this advisory report to you and all Manitobans.

Sincerely,



Colleen Sklar, *Chair*



Dennis Anderson



Ian Gillies



Karla Guyn



Jim Irwin



Andrew MacSkimming



Dimple Roy



Laurie Streich

Executive Summary

On June 12, 2018 the Manitoba government named its Expert Advisory Council, established to provide advice and recommendations to government on implementing the Made-in-Manitoba Climate and Green Plan.

This report sets out the Expert Advisory Council's considerations, advice and recommendations on establishing Manitoba's – and Canada's – first carbon savings account. It contains not just what the Council recommends for a GHG emissions reduction goal for Manitoba for the 2018 to 2022 period, but the specific actions and timetables to put this into effect.

In providing our advice and recommendations, the Council has been mindful of each of the parameters required in Section 3 of *The Climate and Green Plan Implementation Act*. We considered each of them through original modelling of various emissions reduction measures and scenarios, detailed sector analysis and stakeholder input, and the review of both past and future emissions trends and forecasts

Our aim has been to advise the Minister of Sustainable Development on GHG emissions reduction goals and actions that fundamentally 'bend the carbon curve' once and for all and deliver both cumulative and absolute emission reductions over time in Manitoba. We sought to do so in a manner that accounts for the investments made to date to reduce emissions, the nature of the provincial economy and the need for ongoing economic growth.

Carbon Savings Account

The carbon savings account (or CSA) is a unique way to drive ongoing emissions reductions for Manitoba. Simply put, it is the sum of all emission reductions over a five-year period on a cumulative basis. This is tracked against a set cumulative emissions reductions goal for those five years. The emissions reductions are the 'carbon savings'; the tracking against that goal is the 'account'.

Cumulative emissions reductions is the best method to measure carbon emissions reductions in Manitoba, given the province's clean electricity grid and the nature of the province's emissions profile.

Each CSA period will be assigned a cumulative emissions reduction goal for the whole five-year timeframe. That goal will result from a set of specific emissions reduction actions to occur within the five-year CSA. Those actions will continue into subsequent CSA periods and will be built upon with additional emissions reduction measures.

The EAC considers the overall objective of each carbon savings account is to build on the prior account period and produce sustained emissions reductions to:

- Reduce the total amount of carbon emissions that would otherwise be generated in Manitoba without emissions reduction measures from a business-as-usual forecast;
- Reduce the absolute level of carbon emissions in Manitoba measured from the start and end points of each CSA; and
- 'Bend the curve' of provincial carbon emissions over time in Manitoba so sustained emissions reductions occur by ensuring fewer emissions are occurring over each five-year CSA period, compared to business-as-usual.

Recommended Principles

As this is the first time in Manitoba and Canada a carbon savings account concept has been used, the EAC decided to establish a set of principles to guide it in advising and recommending a CSA and specific actions that should be included in it.

- **Effectiveness** – the goal and measures are both effective and cost-effective in reducing emissions.
- **Achievable** – the goal and measures are achievable.
- **Transparent** – the goal, measures, and analysis behind each is transparently set out.
- **Evidence-Based** – the goal and measures are based on solid evidence and analysis.
- **Fair Distribution and Contribution** – the goal and measures imply a fair and reasonable distribution and contribution of effort by emitting sectors and on Manitobans.
- **Dynamic** – the goal and measures can be added to within each CSA period.
- **Sustained Reductions** – the goal and measures lead to sustained emissions reductions.
- **Sustainable Development** – the goal and measures reflect the principles of sustainable development and the importance of both a healthy environment and a strong economy.

These principles were applied by the EAC in each step of its analysis and assessment leading to its recommendation of a carbon savings account for Manitoba. More importantly, the EAC believes these principles are essential for Manitobans to have confidence in the CSA and its application in our province. Reducing emissions is a whole-of-society effort. It takes time. Ensuring buy-in and support by Manitobans for this long-term project is absolutely necessary for its success.

Recommended Carbon Savings Account for 2018-2022

1. Manitoba should set a GHG reduction goal of no less than 1 Mt of CO₂e cumulative emissions reductions. This would 'bend the carbon curve' in Manitoba once and for all and put the province on a sustained path for even greater emissions reductions in subsequent CSA periods.
2. The 1 Mt goal should be comprised initially of the set of specific emissions reduction actions set out in Appendix I.
3. Additional actions should be considered for inclusion based on the EAC's recommendations and then added as soon as practical to the CSA to ensure achieving or surpassing the 1 Mt CSA reduction goal, as set out in Appendix I.
4. Any shortfall in achieving the 1 Mt goal must be added to the subsequent CSA period as part of the 'debit' feature of the CSA to ensure there is no relaxation of effort in reducing emissions.

Measuring against a business-as-usual forecast provides the benchmark to set and measure a CSA goal and actions to achieve that goal. The EAC recommends the dynamic year baseline as the most accurate and realistic way against which to measure progress. It fits the concept of a CSA best as it resets for the next five-year CSA period. It provides the best medium and longer-term baseline to determine future CSA goals. It incorporates all relevant measures by all governments and sectors into the actual level of emissions in that dynamic reference year to measure future progress so nothing is missed.

The emission forecast discrepancies render making recommendations related to the baseline for the 2018-2022 CSA challenging. As such, the EAC recommends that Manitoba track and measure reductions against various baselines and provide the results to the EAC annually. This will help provide further advice on the most relevant baseline for the province, and also inform further CSA considerations. No matter what baseline is used, the CSA reduction goal would still apply.

Recommended Reinforcing Steps

1. Manitoba should adopt the National Energy Code of Canada for Buildings 2017 (NECB 2017) as a mandatory provincial regulation and align the provincial building code accordingly. Future building code improvements should be instituted on a regular, automatic basis and mandated into law after a certain date.
2. A 4R nutrient stewardship program should be designed for active implementation in the agriculture sector to improve farm management practices and reduce emissions.
3. Manitoba should take steps requiring developers to incorporate electric vehicle (EV) charging stations into all new residential and commercial development projects above a minimal size (and as part of major renovations).
4. Manitoba should explore the feasibility of adopting mandatory rules requiring a certain percentage of new motor vehicles sold in the province to be zero emission vehicles (ZEVs).
5. Building from the sector working groups' efforts, a working group should be established to develop policies and approaches to identify viable carbon sequestration opportunities in Manitoba and how they align with similar emerging opportunities in other provinces and regions.
6. In conjunction with the biofuel provisions included within the CSA, Manitoba should work toward the adoption of biofuel mandates for the various transportation subsectors at the highest percentages technically feasible for implementation in the next CSA period. This would help to establish new markets for agricultural products currently facing barriers to market access. Manitoba should then encourage other provinces and jurisdictions to adopt those higher mandates and purchase feedstock for biofuels from Manitoba thereby helping our economy grow.
7. To further integrate the Jobs Pillar of the Manitoba Climate and Green Plan with the government's Economic Development Strategy, a new low-carbon economy sector working group should be established to advise government and the EAC on policies and actions to foster low-carbon growth, investment, and job opportunities building on the province's clean energy brand.
8. As an example of this, the Small Business Venture Capital Tax Credit (SBVCTC) program should be opened up to junior mining companies that are exploring for and developing clean energy minerals in Manitoba such as lithium, cobalt and graphite.
9. Efficiency Manitoba has a key role in offering energy efficiency solutions to Manitoba businesses and consumers to reduce emissions. Ensuring this tool is used to its maximum potential in support of achieving the carbon emission reductions set out in the CSA is necessary. This will require ongoing coordination and alignment of approaches between the government's CSA and Efficiency Manitoba.
10. Manitoba should actively explore construction of an east-west transmission line for exporting clean energy to Saskatchewan.

Recommended Implementation Steps

1. The government should take steps to reinforce that achieving the CSA requires a 'whole-of-government' approach with a commitment by departments and agencies to supporting and aligning policy, programs, and initiatives with the CSA goal. This approach should be coordinated by the Climate and Green Plan Implementation Office.
2. Independent modelling of progress towards the CSA goal should be undertaken on an annual basis and be published as part of the government's annual progress report to the legislature under *The Climate and Green Plan Implementation Act*.
3. Federal government ministers and officials should be briefed on Manitoba's CSA to avoid duplication and overlap in effort by governments and secure the most cost-effective emissions reductions available for Manitobans.
4. A full-accounting CSA should be developed to include both carbon removals and clean energy exports in order to show the complete GHG reductions story for Manitoba.

We need to reduce emissions while still growing the economy and moving it to a lower carbon footprint overall. This will neither be quick nor easy.

Tackling climate change requires all Manitobans to make the effort. This challenge will only get more urgent in the years ahead.

Introduction

This report sets out the Expert Advisory Council's considerations and recommendations on establishing Manitoba's – and Canada's – first-ever carbon savings account. It contains not just what we recommend for a GHG emissions reduction goal for Manitoba, but the specific actions and timetables to put this into effect.

The report is structured as follows:

First, we set out the mandate of the EAC and how we conducted our work.

Second, we profile Manitoba's emissions, illustrating the nature of the province's GHG emissions, and clarifying the challenge and context of reducing those emissions in our province.

Third, we formulate the features and considerations around the carbon savings account. We explain its concept, how it works, what it contains, and how it would be established.

Fourth, we offer our specific recommendations for a 2018-22 carbon savings account including a GHG reduction goal, actions to reduce emissions in this first period, how these should be measured and accounted for, and reinforcing steps to do even more.

The Mandate of the Expert Advisory Council

The Expert Advisory Council (EAC) was established under Section 7 of *The Climate and Green Plan Implementation Act*, passed by the Legislature of Manitoba on November 8, 2018.

The EAC is an independent group of experts with a mandate to provide advice and recommendations to the Minister on the Government of Manitoba's Climate and Green Plan. Specifically, under the Act, the Council is to:

- “(a) provide advice and recommendations to the minister on programs, policies and measures to be included in the climate and green plan;*
- (b) review progress on the implementation of the climate and green plan, and provide advice on any required changes to the plan; and*
- (c) provide advice and recommendations to the minister respecting greenhouse gas emissions reduction goals to be established under section 3.”*

With this broad mandate, the EAC determined with the Minister, as its initial order of business, to focus on advice and recommendations to establish Manitoba's first carbon savings account and GHG emissions reduction goals. This will be the framework for all carbon reduction efforts within the province and hence, was necessary as our first focus.

While this has taken up much of the EAC's time to date, we have also begun work on establishing advice and recommendations on performance goals and progress indicators for the Climate and Green Plan as a whole. This will be the subject of a subsequent advisory report in 2019. Members of the EAC also participated in a separate waste advisory committee process established by the government.

The Climate and Green Plan Implementation Act sets out parameters the EAC must bear in mind as it advises on GHG reduction goals for the province and the carbon savings account. These are:

- “(a) the total amount of greenhouse gas emissions projected to occur in Manitoba in that five-year period if no new greenhouse gas emissions reduction measures are implemented in that period;*
- (b) economic, industrial and demographic projections;*
- (c) the implementation of greenhouse gas emissions reduction measures;*
- (d) the availability and use of new and emerging technologies; and*
- (e) any other considerations that the council considers relevant.”*

The Council has been mindful of each of these parameters established by the Legislature. We considered each of them through original modelling of various emissions reduction measures and scenarios, detailed sector analysis and stakeholder input, plus the review of both past and future emissions trends and forecasts. Much of that information and analysis is set out in this report.

To facilitate and inform its work, the EAC received expert information and analysis from a range of sources, including:

- the province’s Climate and Green Plan Implementation Office (CGPIO) and officials from across the Government of Manitoba
- the International Institute for Sustainable Development (IISD)
- six sector working groups established specifically to consider emissions reduction actions
- the most up-to-date emissions data from Environment and Climate Change Canada (ECCC) and Statistics Canada
- independent expert modelling and analysis commissioned by the EAC
- direct briefings from government officials and national and international experts

The EAC’s work plan consisted of meetings of the EAC itself, plus participation in workshops on industrial carbon pricing as well as approaches to developing a carbon savings account with invited experts and stakeholders, nationally and internationally, including representatives from other governments.

In conducting its work, the EAC sought to be systematic and rigorous in its analysis and realistic in its advice and recommendations. We created an evaluation framework setting out specific criteria through which we could assess various emissions reduction measures and determine their overall feasibility and suitability. This framework is set out in Appendix III.

This evaluation framework was utilized by each of the sector working groups, which were established to provide direct input to the EAC on specific actions or measures to reduce emissions.

Those groups were:

Sector Working Groups and Examples of Measures Considered

Transportation

- renewable content of fuels
- heavy-duty vehicles
- electric vehicles and infrastructure

Buildings

- commercial
- residential
- off-grid communities

Waste

- organics diversion
- white goods management

Agriculture

- energy and technology practices
- soil, crops and livestock management practices

Carbon Sequestration

- enhanced conservation
- afforestation and woodlot management

Low Carbon Government

See Appendix II for a full list of participating organizations in each sector working group.

In contemplating various measures, the EAC considered range of policy instruments and approaches as part of its analysis. These are set out in Appendix III.

Our aim has been to advise on GHG emissions reduction goals and actions that fundamentally ‘bend the carbon curve’ once and for all and deliver both cumulative and absolute emission reductions over time in Manitoba. We sought to do so in a manner that accounts for the investments made to date to reduce emissions, the nature of the provincial economy and the need for ongoing economic growth.

We stress that these goals will not be accomplished all at once. There are many factors that could intervene and complicate this difficult and complex task. It will require sustained effort over many years by all participants and all Manitobans with regular reassessment of emission forecasts and reduction estimates as well as new actions to be taken.

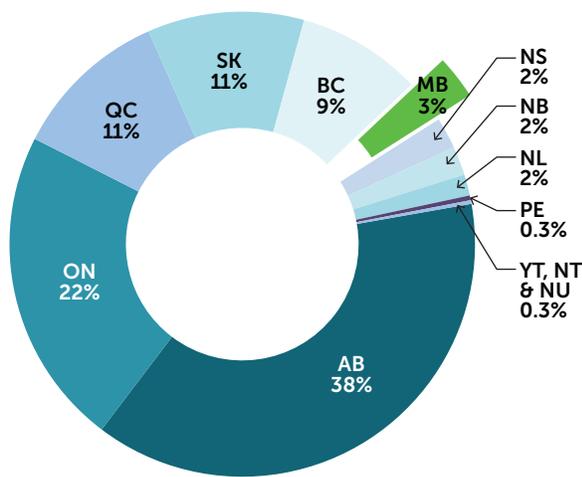
What is required first, though, is a clear path forward to do so. This is what this EAC report sets out.

Manitoba's Emissions Profile

The starting point for determining future reductions of Manitoba GHG emissions is to understand the sources and trends of GHG emissions growth in the province. From here, we can assess the following: first, where to look for emissions reductions and second, how fast and deeply we can achieve emissions reductions.

This section sets out Manitoba's emissions profile. It is based on the most up-to-date data sources from ECCC and the Manitoba government.

Manitoba's Emissions as Share of Total Canadian Emissions (2017)



Overall, Manitoba is Canada's sixth-largest GHG emitter. We account for 3% of total Canadian emissions. Alberta is Canada's largest emitter due to its large fossil fuel energy industry and coal-fired electricity generation, followed by Ontario due to its overall population and economic size.

Data Source: 2019 National Inventory Report¹

¹ 2019 National Inventory Report 1990-2017: Greenhouse Gas Sources and Sinks in Canada, Environment and Climate Change Canada (2019).

On a per-capita, or per-person basis, Manitoba is Canada's sixth largest emitter, just behind Nova Scotia.

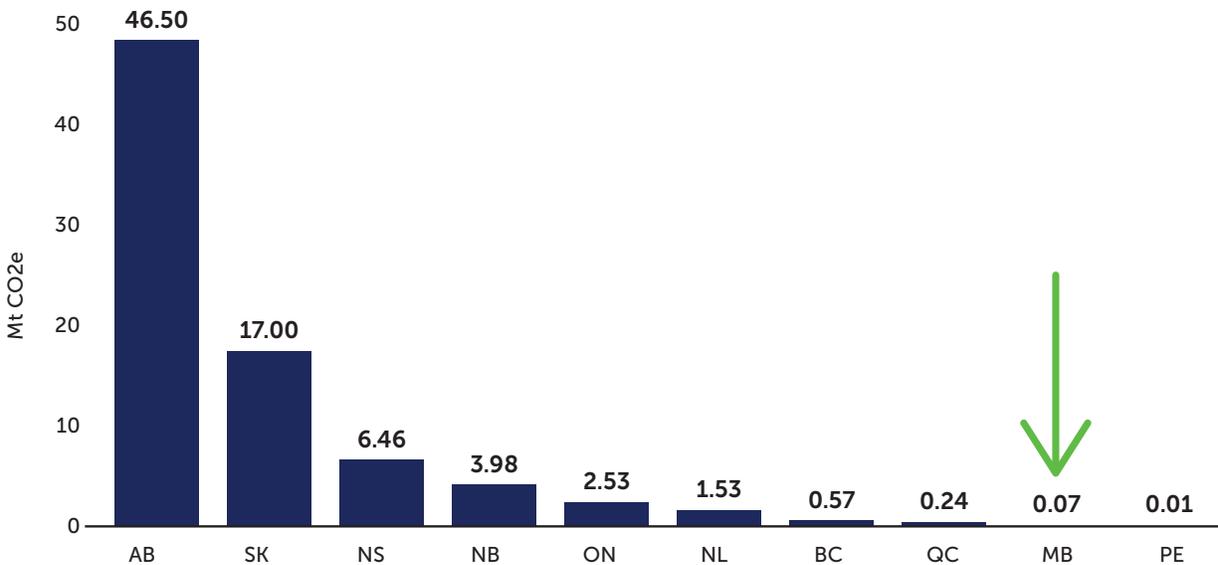
2017 GHG Emissions per Capita by Province



Data Source: 2019 National Inventory Report & Statistics Canada Table: 17-10-0005-01

Manitoba's emissions are low relative to the rest of the country because the province enjoys one of Canada's most clean electricity grids, producing fewer carbon emissions than any other province. (PEI has very little domestically-generated electricity.)

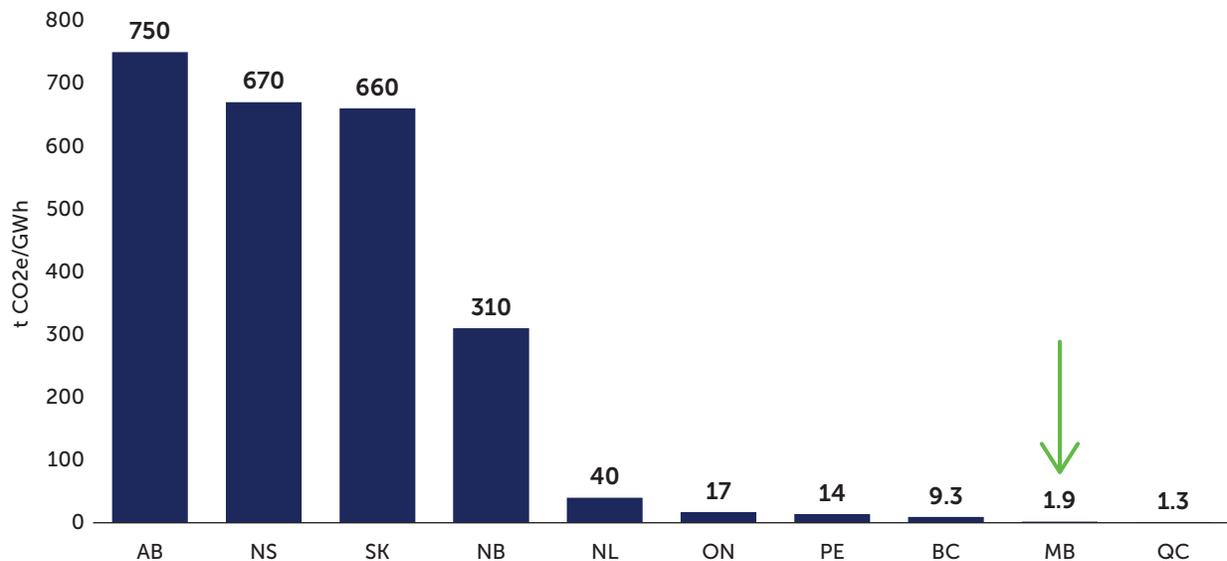
2017 GHG Emissions from Electricity Generation by Province



Data Source: 2019 National Inventory Report

Manitoba's past and current investments in hydro-generated electricity gives the province a very low GHG-intensive electricity generation system compared to the rest of Canada.

2017 GHG Emissions-Intensity of Electricity Generation by Province

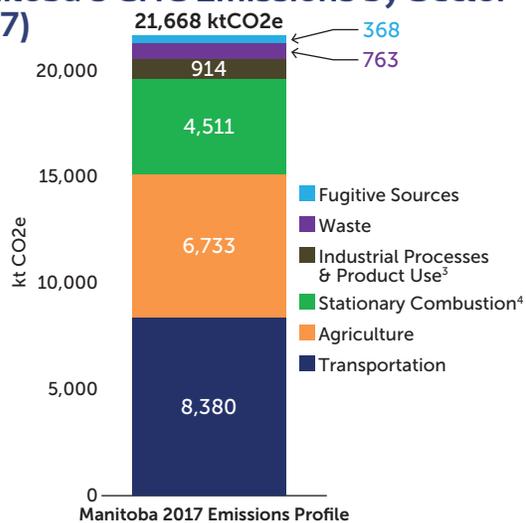


Data Source: 2019 National Inventory Report

CSA Consideration

Manitoba already generates almost 100% of its electricity needs from renewable hydro and wind sources. Because of this clean electricity generation system, Manitoba cannot look to changing its electricity generation as a means of contributing significant GHG emission reductions to its carbon savings account. It will have to look everywhere else for reductions, unlike most other provinces where such reduction opportunities exist.

Manitoba's GHG Emissions by Sector² (2017)



Data Source: 2019 National Inventory Report

Manitoba's total GHG emissions were 21.7 megatonnes (Mt) in 2017. Of that amount, 91% of all emissions came from three sources: transportation, agriculture, and stationary combustion, in that order. Transportation accounted for 39% of GHGs, agriculture for 31%, and stationary combustion in buildings and houses, for example, for 21%. These are the areas we must concentrate our efforts to reduce emissions in Manitoba.

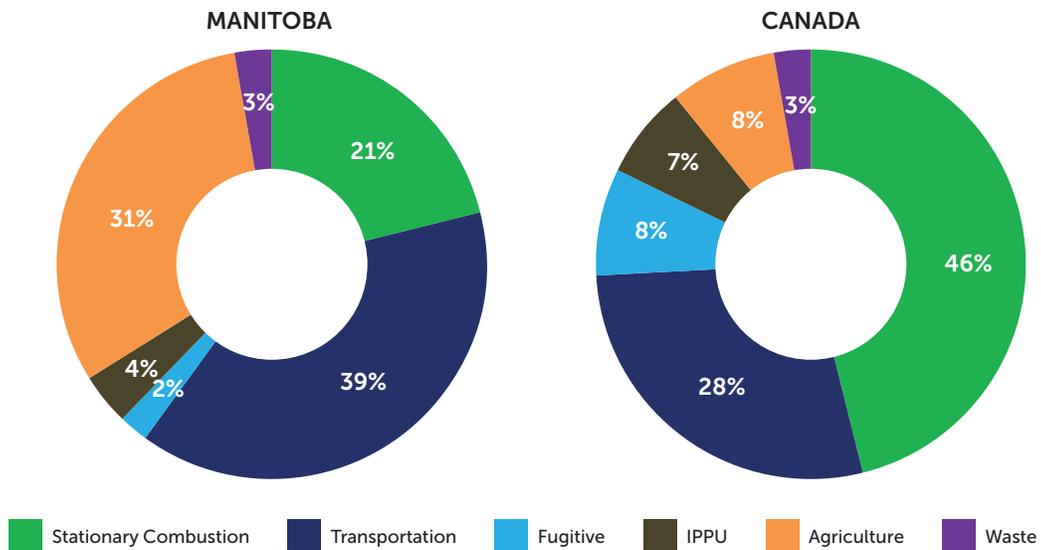
² The emissions profile is broken down by IPCC (Intergovernmental Panel on Climate Change) sector.

³ Industrial processes and product use emissions sources include halocarbons, mineral products, and non-energy products from fuels.

⁴ Stationary combustion emissions relate to fuel combustion. Sources include building heating, manufacturing and construction industries, electricity generation, mining, oil and gas extraction, and agriculture and forestry operations.

Compared to Canada as a whole, Manitoba has a larger proportion of transportation and agriculture emissions. This reflects the important contribution of these sectors to the provincial economy.

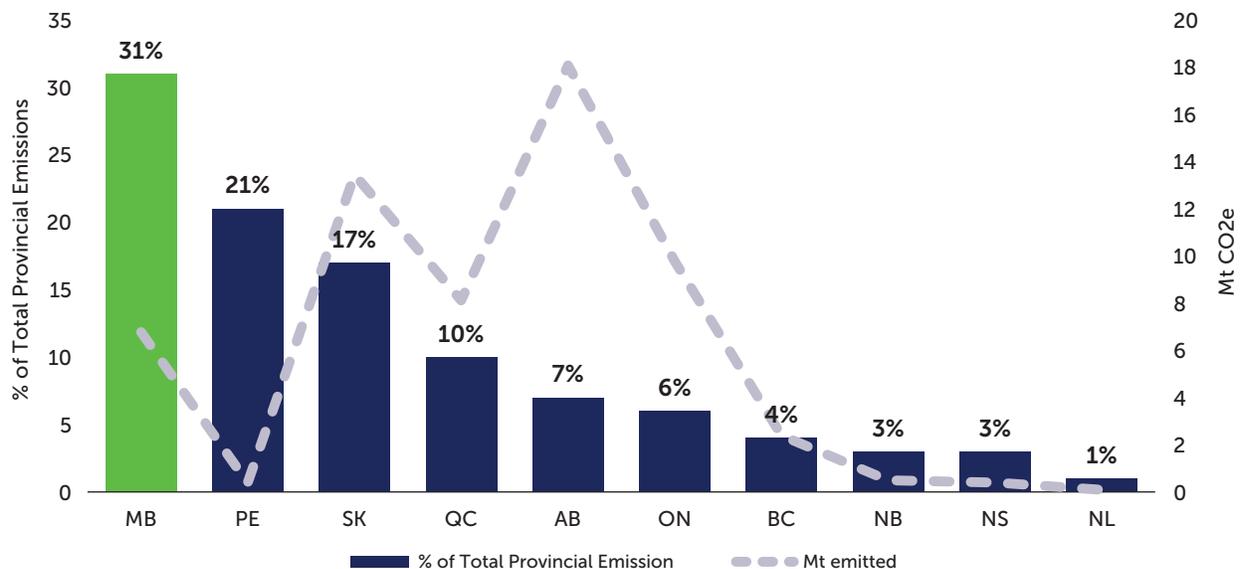
2017 Manitoba and Canada GHG Emissions Profile Comparison



Data Source: 2019 National Inventory Report

The contrast with agriculture emissions is particularly notable. Manitoba's emissions from this sector are significantly higher than the national average – 31% in Manitoba compared to the national average of 8%.

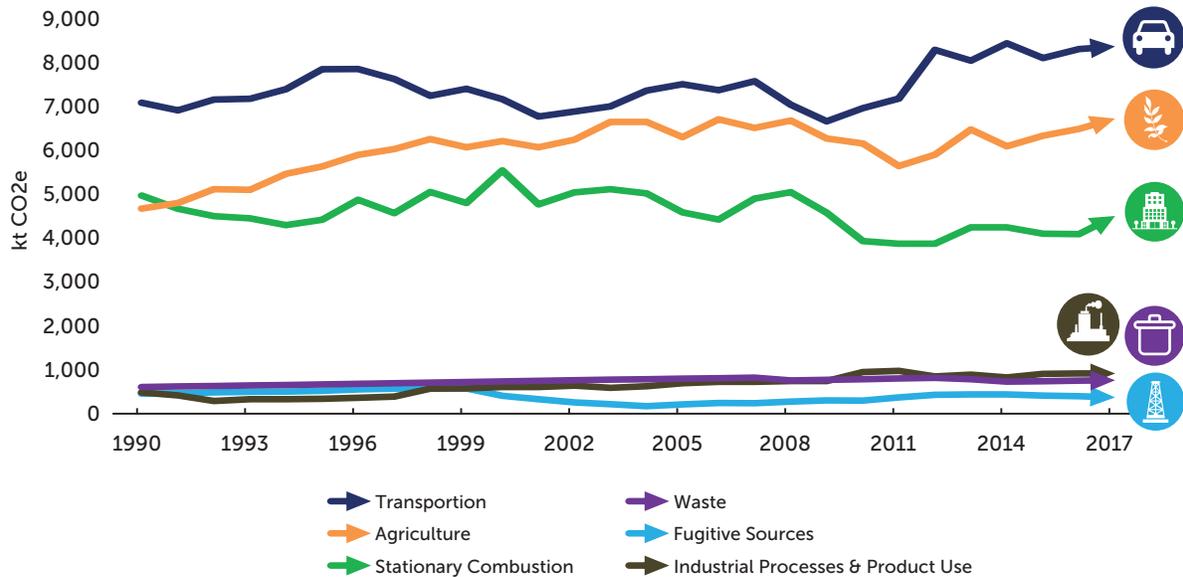
2017 Agriculture Emissions by Province



Data Source: 2019 National Inventory Report

A look at past Manitoba emissions shows clearly that these three sectors – transportation, agriculture, and stationary combustion – have dominated as the primary sources of emissions in the province.

Manitoba's Past Emissions 1990-2017 by IPCC Sector



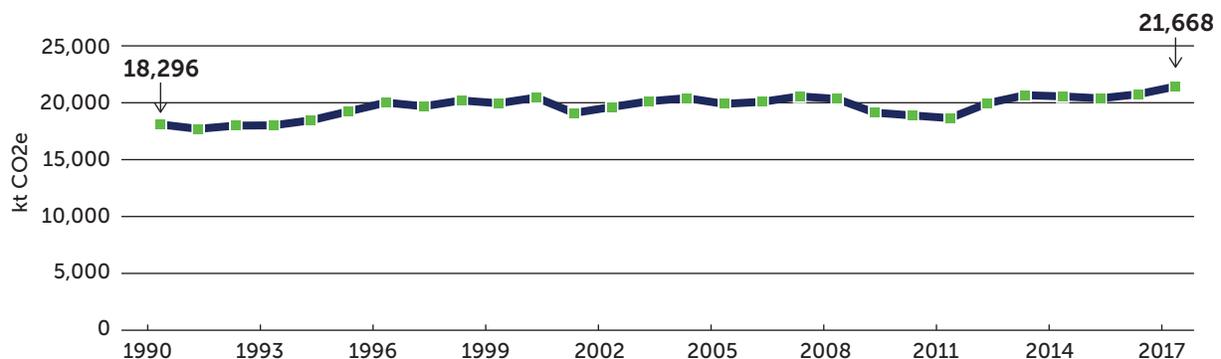
Data Source: 2019 National Inventory Report

CSA Consideration

Manitoba’s unique emissions profile points to where emissions reductions need to come from most - transportation, agriculture, and stationary combustion energy use- if we are to achieve results.

Manitoba’s GHG emissions have grown modestly but regularly from 1990 to 2017. In 1990, emissions were 18.3 Mt; in 2017, they were at 21.7 Mt – reflecting an increase of 3.4 Mt over the period. Declines were experienced during two economic downturns – 2000 and 2008. As the economy recovered so too did emissions growth.

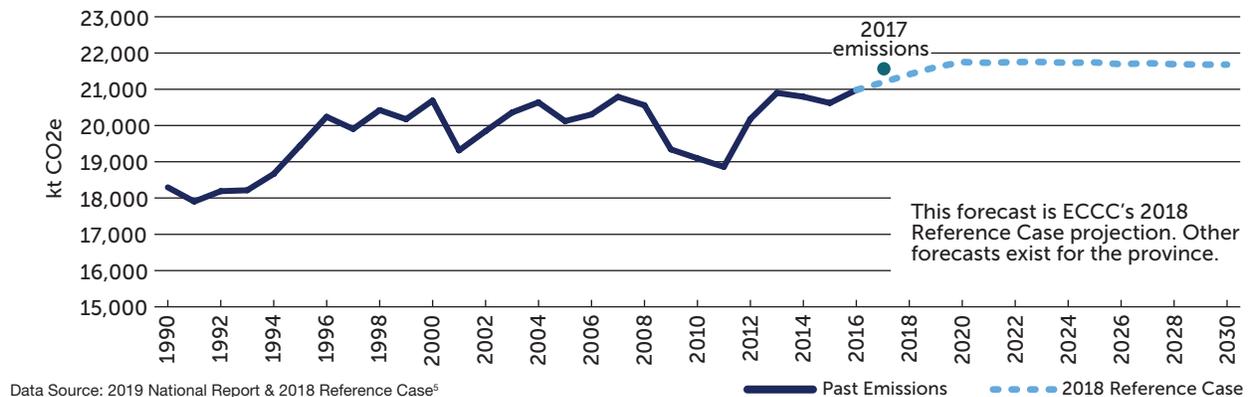
Manitoba’s Past Emissions 1990-2017



Data Source: 2019 National Inventory Report

Looking ahead, the same pattern is forecast. Projected emissions from now to 2030 show modest but continued GHG growth from a business-as-usual (BAU) scenario as shown in the figure below and Appendix VI. Without specific emissions reduction action, Manitoba's emissions will continue to rise.

Manitoba GHG Emissions Forecast



CSA Consideration

Overall, Manitoba's emissions have been rising, not falling. We have not yet 'bent the carbon curve' to put emissions on a sustained downward path. While no large jumps in emissions are likely, Manitoba is forecasted to have continued emissions growth over the next 15 years unless new actions are taken to reduce our emissions.

GHG Emissions and the Economy

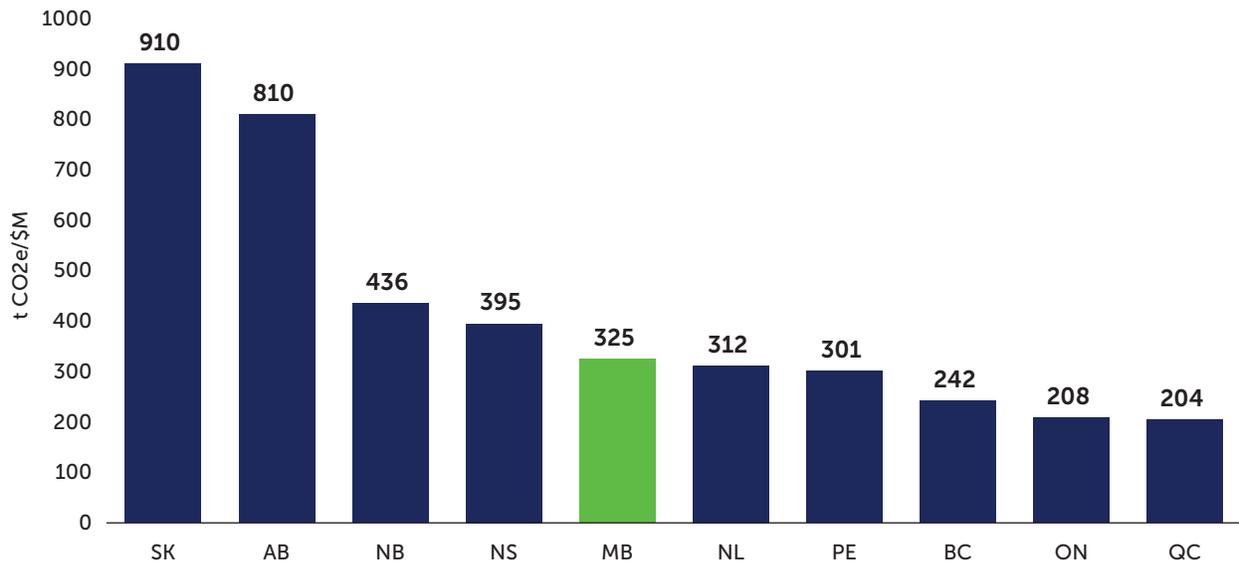
Greenhouse gas emissions are the result of economic activity, energy production and use, and land use management. The cars and trucks we drive, the heat and lights for our homes and businesses, the energy used for manufacturing or mining or agriculture, all contribute to GHG emissions. At the same time, that economic activity – and resulting GHGs – contribute to wealth and GDP.

Saskatchewan and Alberta lead Canada in terms of how much economic wealth is generated by highly GHG-intensive activity – in this case, oil and gas production and use, and coal-fired electricity generation.

Despite Manitoba's clean electricity grid, it stands fifth in GHG emissions-intensity of its economy overall in Canada. This is due to emissions from the transportation and agriculture sectors, as principal economic contributors.

⁵ 2018 Reference Case for Manitoba, Environment and Climate Change Canada (2018).

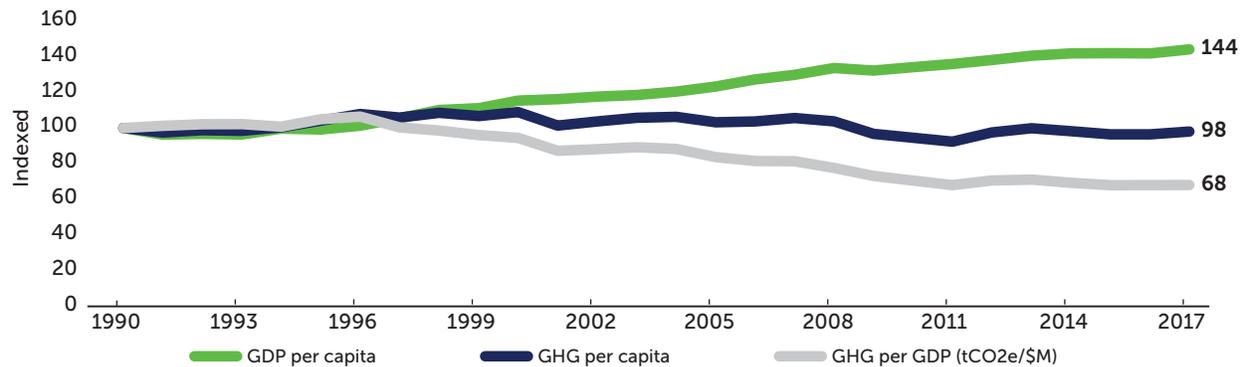
2017 GHG Emissions-Intensity of Provincial Economies



Data Source: 2019 National Inventory Report & Statistics Canada Table: 36-10-0222-01

Over the past almost 30 years, Manitoba has seen both stability and improvement in its GHG emissions profile as economic growth (GDP) has increased. On a per-capita basis, GHGs have remained stable over time. On a GDP basis, GHGs have actually declined since 1990 mostly due to clean electricity and energy efficiency.

Manitoba GHG & GDP Trend 1990-2017



Data Sources: 2019 National Inventory Report & Statistics Canada Tables: 17-10-0005-01 and 36-10-0222-01

CSA Consideration

Manitoba's emissions continue to rise overall despite ongoing improvements in decoupling GHG growth from GDP growth.

Industrial Emissions in Manitoba

Manitoba has only six large industrial emitters producing 50,000 tonnes or more of CO₂e each year. Industrial emissions rise and fall with economic growth cycles, commodity prices, and resource extraction and production demands. Overall, industrial emissions contribute less to the province's total emissions now than they did 20 years ago. Nevertheless, they account for about 1.6 Mt of CO₂e or about 7% of total Manitoba emissions.

Uniquely, Manitoba's largest industrial emitters are not represented in any one sector but in six different sectors with one company contributing most emissions in each. The table and figure below shows the top industrial emitters in Manitoba and their sectors.

Company/Facility	Sector	Total 2017 Emissions (tonnes CO ₂ e)
Koch Fertilizer Canada, ULC	Nitrogen Fertilizer	662,339
TransCanada PipeLines Ltd.	Natural Gas Pipelines	182,061
Graymont Western Canada Inc.	Lime	127,822
Canadian Kraft Paper Industries Ltd.	Pulp and Paper	80,703
Husky Oil Operations Limited	Chemicals (ethanol)	77,198
Vale Canada Limited	Mining	62,718

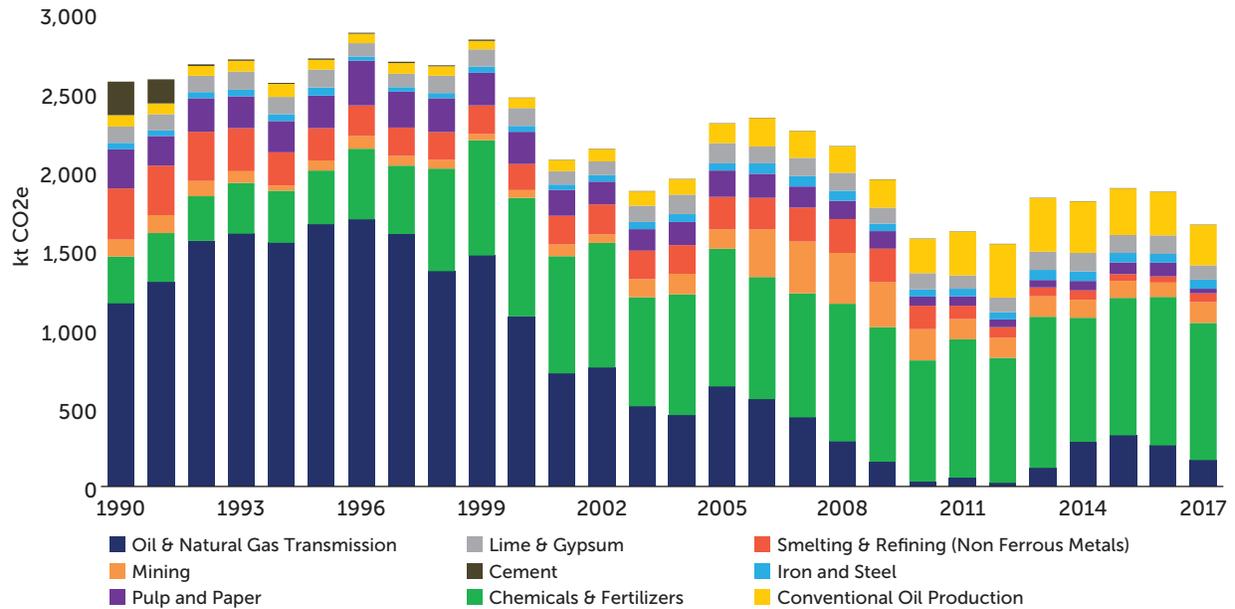
Data Source: 2017 GHG Reporting Program⁶

Large industrial emitters are often referred to as 'emissions-intensive, trade-exposed' (EITE). That is because they use GHG-intensive fuels and processes to extract or produce their commodities or products (emissions-intensive) which are typically exported internationally (trade-exposed). Reducing emissions from such sectors and facilities can be a complex undertaking to potential negative impacts, such as job losses and production declines, as businesses reduce operations and investments or even relocate to other jurisdictions with weaker carbon reduction policies. If a business opts to make investment in or relocate to a jurisdiction with weaker policies, GHG emissions may not be reduced globally.

⁶ Greenhouse Gas Reporting Program, Environment and Climate Change Canada (2017).

The figure below shows the makeup of Manitoba's EITE emissions over time.

Manitoba's Past EITE Emissions 1990-2017



Data Source: 2019 National Inventory Report

CSA Consideration

Manitoba's emissions profile demonstrates that no one economic sector, nor one single action, can be expected to produce significant emissions reductions on its own. A range of targeted actions across all economic sectors is required to reduce emissions and sequester carbon.

Manitoba's Carbon Savings Account

The carbon savings account (or CSA) is a unique way to drive ongoing emissions reductions for Manitoba. This will be the first time it is used in Canada. Simply put, it is the sum of all emission reductions over a five-year period on a cumulative basis. This is tracked against a set cumulative emissions reductions goal for those five years. The emissions reductions are the 'carbon savings'; the tracking against that goal is the 'account'.

The advantages of the CSA approach are several:

First, it ensures regular progress towards emissions reductions by setting, measuring, and adjusting against shorter (5 year) goals rather than longer-term targets too far into the future.

Second, it recognizes that the level of emissions in a future target year are not as important to tackling climate change as is the cumulative emissions over the CSA period. It is the stock of emissions going into the atmosphere each year that accumulate and cause climate change. The annual and cumulative emissions being generated should be the focus of reduction efforts, not just achieving a one-off target into the future.

Third, the CSA goal allows for individual sectors to contribute to emissions reductions in a more organized and effective way rather than rely on single, one-off measures.

Fourth, the shorter CSA period allows for greater transparency of progress and therefore accountability of results by government and sectors through more regular reporting.

Fifth, each CSA can be built upon the preceding period to ensure Manitoba is making real progress towards actual emissions reductions.

To reduce emissions in Manitoba, we must produce fewer of them in the years ahead. That means availing ourselves of current and future low-carbon technologies, using less energy in our daily activities, switching to clean electricity and low-carbon fuels, becoming more energy efficient, and focusing our efforts on the biggest, most carbon-intensive emissions sources in our province and economic sectors. A carbon savings account framework best captures the management of all these elements.

CSA Principles

As this is the first time in Manitoba and Canada a carbon savings account concept has been used, the EAC decided to establish a set of principles to guide it in advising and recommending a CSA and specific actions that should be included in it.

- **Effectiveness** – the goal and measures are both effective and cost-effective in reducing emissions.
- **Achievable** – the goal and measures are achievable.
- **Transparent** – the goal, measures, and analysis behind each is transparently set out.
- **Evidence-Based** – the goal and measures are based on solid evidence and analysis.
- **Fair Distribution and Contribution** – the goal and measures imply a fair and reasonable distribution and contribution of effort by emitting sectors and on Manitobans.
- **Dynamic** – the goal and measures can be added to within each CSA period.
- **Sustained Reductions** – the goal and measures lead to sustained emissions reductions.
- **Sustainable Development** – the goal and measures reflect the principles of sustainable development and the importance of both a healthy environment and a strong economy.

The CSA approach and principles are based in part on research about the United Kingdom Climate Change Committee and its experience with carbon budgets and discussions with its former CEO.

These principles were applied by the EAC in each step of its analysis and assessment leading to its recommendation of a carbon savings account for Manitoba. More importantly, the EAC believes these principles are essential for Manitobans to have confidence in the CSA and its application in our province. Reducing emissions is a whole-of-society effort. It takes time. Ensuring buy-in and support by Manitobans for this long-term project is absolutely necessary for its success.

CSA Consideration

A series of principles, as set out above, should be the guide in developing Manitoba's carbon savings account and determining actions to achieve it.

How a CSA Works

Each CSA period will be for 5 years. The first CSA will run from 2018-2022, with subsequent five-year periods as follows:

- CSA 1 – 2018-22
- CSA 2 – 2023-27
- CSA 3 – 2028-32

Each CSA period will be assigned a cumulative emissions reduction (CER) goal for the whole five-year timeframe. That CER goal will result from a set of specific emissions reduction actions to occur within the five-year CSA. Those actions will continue into subsequent CSA periods and will be built upon with additional emissions reduction measures.

The EAC considers the overall objective of each carbon savings account is to build on the prior account period and produce sustained emissions reductions to:

- a. Reduce the total amount of carbon emissions that would otherwise be generated in Manitoba without emissions reduction measures from a business-as-usual forecast;
- b. Reduce the absolute level of carbon emissions in Manitoba measured from the start and end points of each CSA;
- c. 'Bend the curve' of provincial carbon emissions over time in Manitoba so sustained emissions reductions occur by ensuring fewer emissions are occurring over each five-year CSA period, compared to business-as-usual.

Cumulative emissions reductions over the CSA period should be the method to measure progress for reducing emissions in Manitoba. This approach recognizes that measuring one year's decline or growth in emissions does not provide a complete picture of whether progress is being made or is sufficient. Nor does simply setting a distant target in a forecast year. As the United Nation's Intergovernmental Panel on Climate Change stated:

"the finding that climate warming responds linearly to cumulative carbon emissions is a powerful way to frame the climate problem, and opens avenues for both changing how we approach climate mitigation, as well as better predicting the climate impacts associated with a given emission pathway."

The United Kingdom's Climate Change Committee also stated: *"...it is not simply the level of emissions in a future target year that we should be concerned about. It is cumulative emissions over the whole period that matter."*

CSA Consideration

Cumulative emissions reductions is the best method to measure carbon emissions reductions in Manitoba, given the province's clean electricity grid and the nature of the province's emissions profile.

It is important to understand 'business-as-usual' or BAU in emissions forecasting. The starting point for each forecast of emissions is business-as-usual. BAU has four main components:

1. Economic growth that produces emissions
2. Population growth that produces emissions
3. Energy use that produces emissions
4. Climate action measures to reduce emissions

Several variables go into these forecasted components such as: historical data on GHG emissions, energy production and use, and economic data; GDP and population growth, oil and gas prices, and industrial production projections; and existing and announced climate action measures that will reduce emissions.

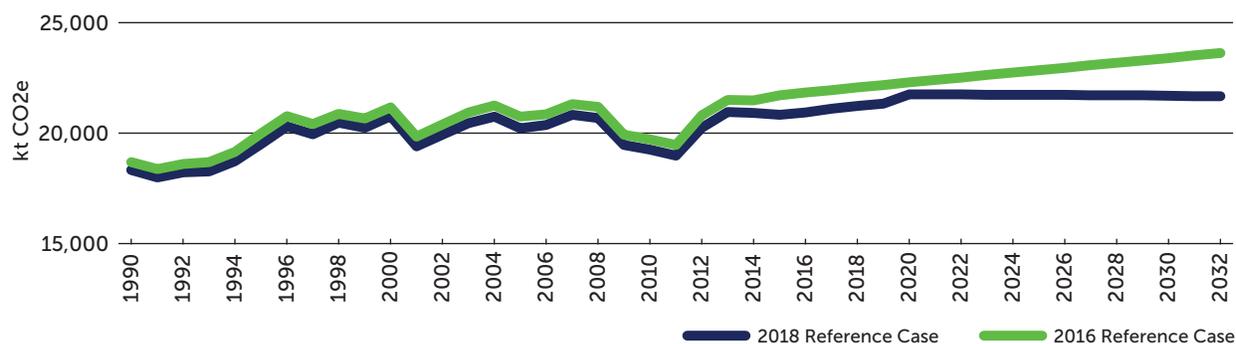
BAU is the forecasted projection of what emissions would look like if no actions were put in place to reduce emissions. It is the starting point for two things: (a) how much needs to be done to reduce emissions to achieve desired goals, and (b) what to measure success against in terms of cumulative emissions reductions from that BAU or what emissions would have been in the absence of climate actions.

BAU forecasts are updated each year based on new information received by the federal government and published in its annual National Inventory Report. For each updated annual report, previous year forecasts are adjusted based on final statistical information provided by companies and various sectors across the economy. Changes in economic growth and oil and gas prices are accounted for as well as other key variables noted above. Assumptions about take-up and results of climate action measures are reviewed against actual results.

Not unlike a government’s annual budget, the BAU is measured against what was forecasted for emissions reductions and what was actually achieved. Differences between ‘forecasts’ and ‘actuals’ are then incorporated into the revised BAU. Experience teaches what variables forecasts are sensitive to and can be presented accordingly in the BAU. Noting these sensitivities in a GHG forecast is important for clearly understanding and assessing actions and progress towards actual emissions reduction results.

The figure below illustrates the difference between the 2018 and 2016 BAU forecasts for Manitoba.

Business-as-Usual Forecasts in Manitoba



Data Source: 2018 Reference Case & 2016 Reference Case⁷

CSA Consideration

Measuring against a business-as-usual forecast provides the benchmark to set and measure a CSA goal and actions to achieve that goal. This approach is used by all governments in Canada in considering the potential impact of climate actions.

⁷ 2016 Reference Case for Manitoba, Environment and Climate Change Canada (2016).

The CSA 'Debit' Feature

A key feature of the CSA approach is to build in a 'debit' mechanism so that any shortfall in cumulative emissions reductions occurring in one CSA period is added to the goal for the next CSA period. This means that the subsequent CSA goal would increase by a minimum of this amount to maintain the overall reduction direction and amounts.

The video below explains both the carbon savings account concept and how the debit mechanism would apply.



<https://www.youtube.com/watch?v=N9AGxUi4P4E>

CSA Consideration

Any shortfall in achieving the CSA goal over a five-year period will be added to the subsequent CSA goal to ensure an ongoing commitment to emissions reductions.

Establishing the Baseline

The *Climate and Green Plan Implementation Act* stipulates that the first CSA period will be 2018-2022. As a first step, the EAC needed to establish a clear baseline for (a) forecasting future emissions growth, and (b) measuring emissions reductions against that forecasted growth.

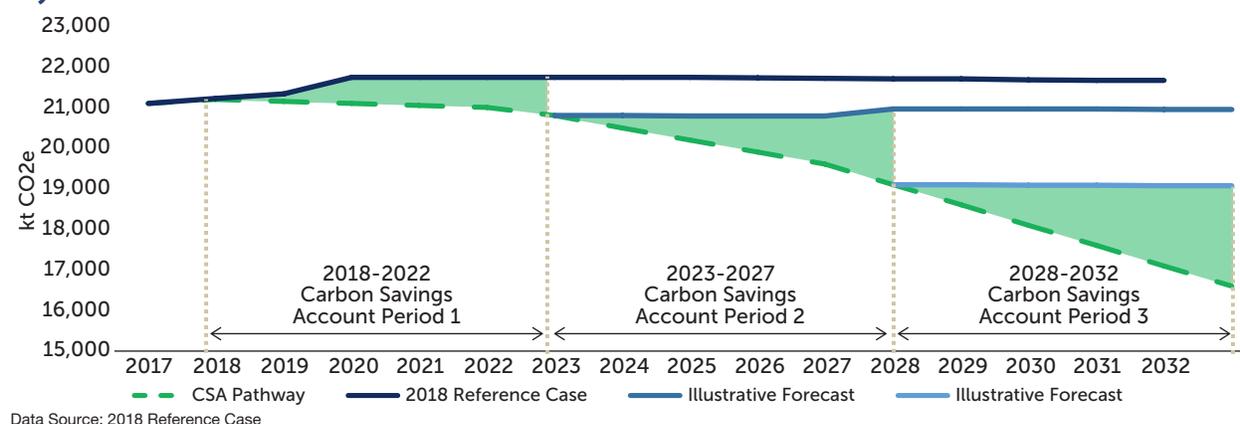
The EAC considered four baseline approaches:

- a static reference year (picking any past single year such as 2005 and measuring progress against that one year)
- a dynamic reference year (picking the year before each CSA period commences which would be 2017 for the first period, 2022 for the second period, and 2027 for the third period)
- a business-as-usual baseline year (based on the BAU forecast for Manitoba)
- or a federal measures baseline year (based on the BAU forecast after proposed federal measures such as carbon pricing were included).

The EAC recommends the dynamic year baseline as the most accurate and realistic way against which to measure progress. It fits the concept of a CSA best as it resets for the next five-year CSA period. It provides the best medium and longer-term baseline to determine future CSA goals. It incorporates all relevant measures by all governments and sectors into the actual level of emissions in that dynamic reference year to measure future progress so nothing is missed. (However, as noted later in this report, there are emissions forecast discrepancies, and for the 2018-2022 CSA, we recommend Manitoba measure reductions against various baselines. This will help the EAC provide further advice on the relevant baseline for the province.)

Below is how a dynamic year baseline would work in setting the first and subsequent cumulative emissions reduction goal in each CSA period, based on an illustrative 2-4-6 Mt CSA scenario.

Dynamic Reference Baseline – Illustrative CSA Goals



CSA Consideration

The dynamic baseline year provides the best starting point to gauge emissions reduction needs and results against – what are actual emissions in that year.

Measuring CSA Progress

Each year, the government is required under *The Climate and Green Plan Implementation Act* to provide an annual progress report on emissions reductions in Manitoba. The relevant sections are these:

“Reporting on greenhouse gas emissions reductions

5(2) If a measure under the climate and green plan results in a reduction in greenhouse gas emissions, the annual report must set out the emissions reduction achieved.

Emissions reduction goal and carbon savings account

5(3) The annual report must set out the applicable greenhouse gas emissions reduction goal established under section 3 and the current status of the carbon savings account”

The CSA goal must be measurable if it is to be achievable. An important part of the EAC’s work, therefore, has been to consider how to establish the methodology and measurement benchmarks to meet this obligation.

As the CSA is a new and dynamic concept requiring ongoing addition of new measures and annual measurement of progress, the EAC was mindful of the need to incorporate regular updated data and information and establish a robust reporting and measurement framework as a first step. Like all provinces, Manitoba relies on Environment and Climate Change Canada for core emissions results and forecasts. Specifically, the development, measurement and reporting of the carbon savings account is based on several data sources:

- The National Inventory Report outlines annual and historical emissions for Canada and the provinces and territories. ECCC publishes its inventory annually including anthropogenic (human caused) emissions by sources and removals by sinks.
- Environment and Climate Change Canada develops a forecast that projects emissions under a notional scenario where no new measures are implemented. ECCC updates GHG emissions forecasts annually but only publishes forecasts every second year in Canada’s Biennial Report.

The Government of Manitoba will publish annual reports, outlining the policies, programs and measures employed in that year to implement the Climate and Green Plan, including any resulting GHG emission reductions. At the conclusion of the five-year CSA, the Government of Manitoba will prepare a report on GHG emissions throughout the period, including confirmation if the CSA goal was achieved. Because there is a two-year time lag between the National Inventory Report publication and GHG emissions, the Government of Manitoba is expected to release the final five-year report for the 2018 to 2022 CSA in mid 2024. The chart below sets out the timetable for federal and provincial reporting on Manitoba’s emissions for this first CSA period.

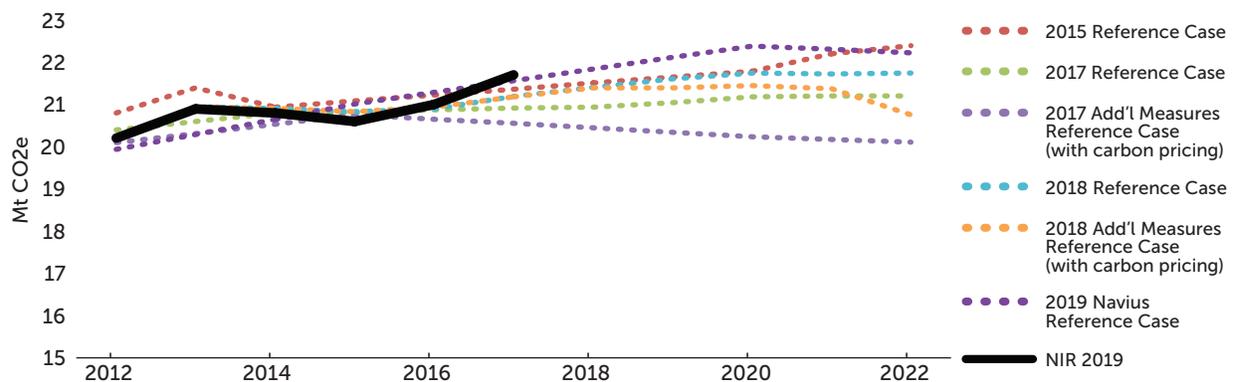
YEAR	2018	2019	2020	2021	2022	2023	2024
ECCC National Inventory Report	Publication of 2016 emissions by April 2018	Publication of 2017 emissions by April	Publication of 2018 emissions by April	Publication of 2019 emissions by April	Publication of 2020 emissions by April	Publication of 2021 emissions by April	Publication of 2022 emissions by April
ECCC Forecast	2018 forecast by November (based on established measures as of Nov 1 2018)	2019 forecast by November	2020 forecast by November	2021 forecast by November	2022 forecast by November	2023 forecast by November	2014 forecast by November
	Publication of 2017 forecast by January 2018		Publication of 2019 forecast by January		Publication of 2021 forecast by January		Publication of 2023 forecast by January
Manitoba Climate and Green Plan Annual Report			✓	✓	✓	✓	✓
5-year CSA Report							✓

Forecasts attempt to project outcomes in the future based on various assumptions. Forecast provide helpful insights into the future; however, they are not perfect representations. Future ambiguities such as oil and gas prices, economic and population growth, and policy decisions in and outside of domestic borders create inherent uncertainties for forecasts. As can be seen in the figure below, forecasted emissions tend to diverge from observed emissions, as reported in the NIR, with less forecasting accuracy over time. That is why it is necessary to model a range of reference-case scenarios to determine the range of potential emissions growth.

The emission forecast discrepancies render making recommendations related to the baseline for the 2018-2022 CSA challenging. For example, the 2018 Reference Case established in November 2018 forecast emissions for 2017 of 21.2 Mt; however the inventory report issued a couple months later in April 2019 indicated the emissions were 21.7 Mt. This 0.5 Mt difference is notable in the province of Manitoba with relatively few emissions. See Appendix VI for a table showing historical forecasts versus the actual National Inventory Report emissions for Manitoba.

As such, the EAC recommends that Manitoba track and measure reductions against various baselines and provide the results to the EAC annually. This will help provide advice on the most relevant baseline for the province, and also inform further CSA considerations. No matter what baseline is used, the full recommended CSA reduction goal would still apply. The figure below illustrates the range of reference-case scenarios modelled:

GHG Emissions Forecasts for Manitoba



Data Source: 2019 National Inventory Report & ECCC Reference Cases for Manitoba⁸ & Navius Research Inc. Forecast⁹

CSA Consideration

GHG forecasts and actual emissions for a given year will fluctuate as ECCC updates data each year. The CSA goal needs to take this into account in order to ensure continued progress on emissions reductions that is accurate and accountable for measuring progress and determining future actions.

Federal Climate Actions in Manitoba

A key consideration for the EAC is to determine whether to include federal climate actions in determining Manitoba’s CSA goal or not. For the atmosphere, who ‘owns’ the emissions or causes the emissions is immaterial. They are all lumped in together. But for determining accountable actions by governments in reducing emissions, they need to be distinguished and separated.

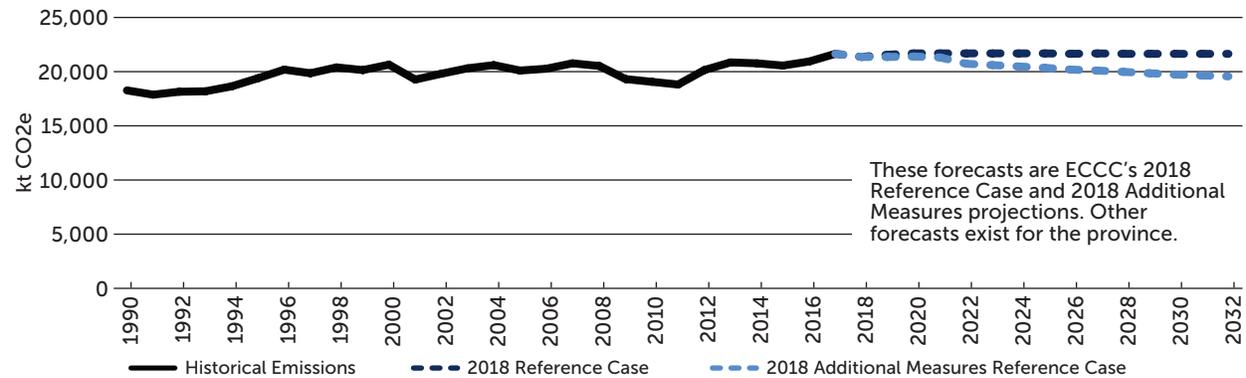
The figure below shows the forecast emission reductions from current and proposed federal actions compared to the business-as-usual forecast for Manitoba. These include:

- the federal backstop of a carbon tax on fossil fuels commencing at \$20 per tonne in 2019, rising to \$50 per tonne in 2022
- the federal backstop of an output-based carbon price on large industrial emitters
- a clean fuel standard (proposed, not established)
- Low Carbon Economy Fund investments
- strategic interconnections in electricity
- building retrofits
- post-2025 light-duty vehicle regulations

⁸ Canada’s 7th National Communication and 3rd Biennial Report and Canada’s 2nd Biennial Report on Climate Change, Environment and Climate Change Canada (2018 and 2016).
⁹ gTech Model Manitoba forecast, Navius Research Inc. (May 2019).

The figure shows that emissions in Manitoba are forecasted to decline slightly from the current business-as-usual forecast for 2018-2032 with these additional measures. This includes the estimated 0.99 Mt of emission reductions in the 2018-2022 CSA period as a result of federal carbon pricing.

Historical Manitoba GHG Emissions & GHG Emissions Forecast



Data Source: 2019 National Inventory Report & 2018 Reference Case & 2018 Additional Measures Reference Case

Separating actions from one government or sector can be somewhat misleading. The reality is that in the real economic world, actions by all governments will affect the behaviour of people, businesses, and sectors. Specifically, carbon pricing being implemented by the federal government will interact with actions chosen by the Manitoba government. These 'interactive' effects need to be factored in by GHG forecast modelling in assessing emission reduction results. The Manitoba government is not responsible for the impacts of these federal measures but needs to take them into account in determining its own CSA.

To that end, the EAC has chosen to represent the results of emission reduction actions within the CSA period on a disaggregated basis (separate accounting for new Manitoba actions). It does so to show clearly the effects of Manitoba's actions over and above the existing provincial and federal measures for transparency and accountability purposes.

CSA Consideration

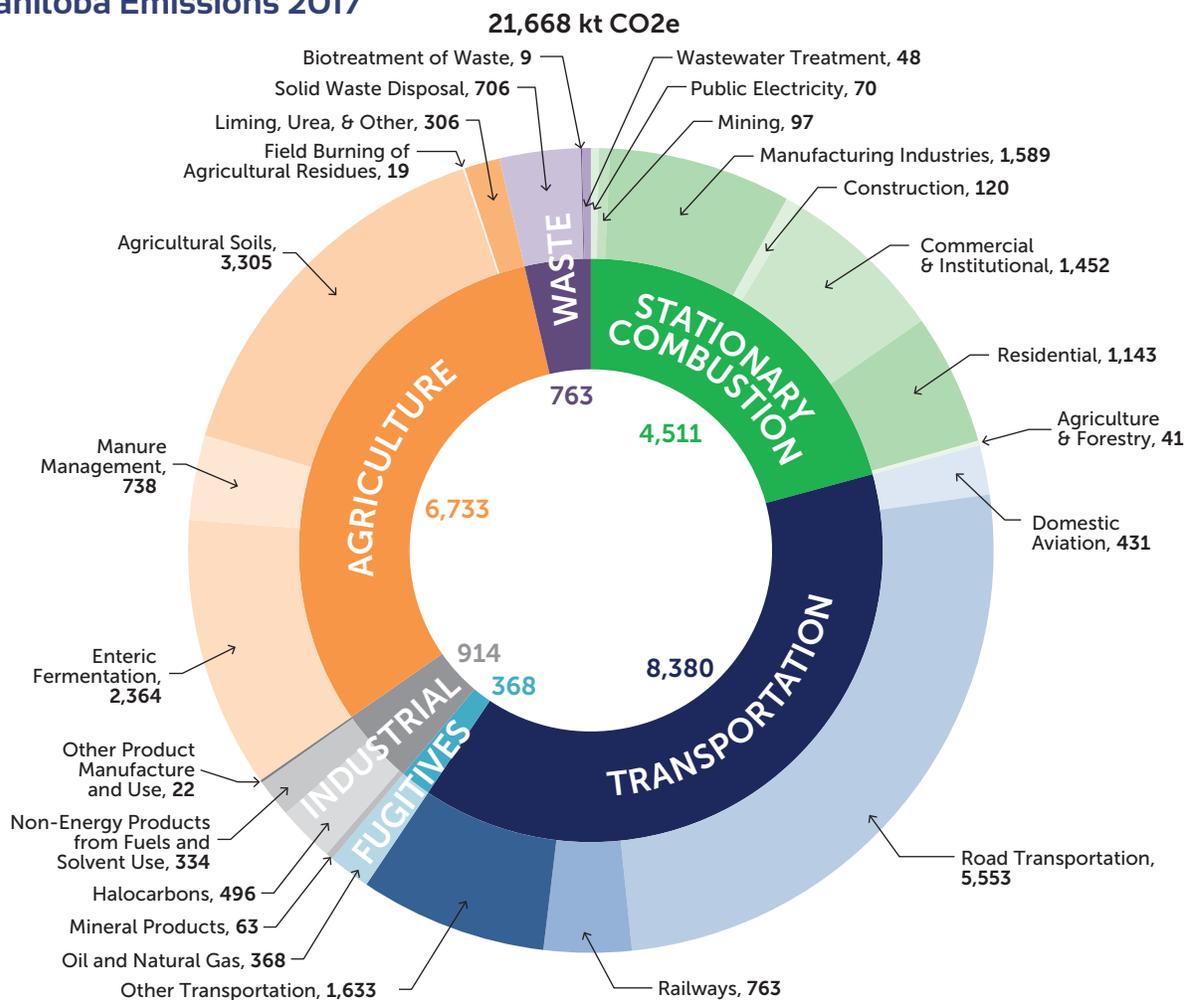
Manitoba is responsible only for emissions reductions from its own implemented actions. Emission reductions from all levels of government, however, need to be understood in establishing Manitoba's carbon savings account.

Sector Emissions and Reduction Opportunities

The Made-in-Manitoba Climate and Green Plan identifies sector emission reductions coming from economic sectors and energy users as a priority area for action. The EAC examined the nature of sector emissions to assess possible actions. At the same time, a series of sector working groups were established to review possible actions set out in the Climate and Green Plan, as well as others, and offer views and ideas for EAC consideration. These were the most advanced in development and hence, are recommended for inclusion in the CSA in this first report of the EAC.

The figure below identifies the main components of each sector's emissions in Manitoba. This is the detailed basis for determining carbon reduction opportunities. Within each sector, a number of priority areas emerge based on the amount of emissions in each sub-sector. The top ones include: road transportation; building, manufacturing, and residential heat and energy use; and agricultural soils. These provided the initial focus of the EAC's analysis and assessment.

Manitoba Emissions 2017



Data Source: 2019 National Inventory Report

This sector approach aligns with the government's Economic Development Strategy also. The December 2018 *Economic Growth Action Plan* for Manitoba calls for the development of sector competitiveness strategies. Reducing emissions in targeted sectors as well as growing those sectors in a low-carbon manner should be considered together. This is how that report cited Manitoba's "clean and green advantage":

The Clean and Green Advantage

Stakeholders frequently pointed to the potential to pursue opportunities in clean technology. As the world transitions to a low-carbon economy to address climate change, clean technology development will present new opportunities for Manitoba companies.

Manitoba's clean hydro-electricity was often cited as a strength, as was our 'clean and green' brand, which can be used to attract new investment in a world increasingly seized with growing, producing, and selling products and services that are equally 'clean and green'.

This is consistent with the government's Climate and Green Plan.

Details on the recommended initiatives for inclusion in the 2018-2022 CSA are provided in Appendix I. The following sections provide further information related to some areas.

Carbon Sequestration, Land Use, and Agricultural Management in Manitoba

Manitoba's Climate and Green Plan encourages steps to increase carbon sequestration in our lands and forests. Land and forests can act as a 'carbon sink', sequestering carbon that would otherwise go into the atmosphere. A complete CSA for the province would take carbon removals as well as emissions into account. Incorporating sequestration into the CSA is difficult. Trees and forests can store carbon, but a forest fire can release it.

Current analysis and inputs from experts indicate that carbon removals from lands and forests in Manitoba will not have a significant impact on the emissions profile in the 2018 to 2022 period.

GHG Emissions Accounting Considerations

GHG emissions accounting is generally done in two streams – the inventory of emissions from transportation, stationary combustion, agriculture practices, waste, etc, and the inventory for LULUCF emissions.

Land Use, Land Use Change, and Forestry (LULUCF), is defined as a greenhouse gas inventory sector that covers reports on emissions and removals of greenhouse gases resulting from direct human-induced land-use, land-use change, and forestry activities. The LULUCF reporting categories include: forest land; cropland; managed agricultural grassland; settlement land; wetlands. The emissions are tracked distinctly due to various reasons, such as the natural effects can be relative large. Emissions and removals from lands exposed to natural disturbances such as wildfires and severe insect infestations, are tracked separately as they can have large impacts on annual emission and removal estimates and their occurrence is outside of human control.

National and provincial GHG emissions inventory totals are reported to the UNFCCC with and without LULUCF.

Note that emission sources from the agriculture and forestry sectors are accounted for in the inventory of emissions. For example, agriculture emissions included in the GHG emissions inventory include energy use, enteric fermentation, manure management, agricultural soils, field burning of agricultural residues and liming, urea application and other carbon-containing fertilizers.

The EAC has provided advice on actions that can improve our carbon sequestration potential and how these actions can be considered within future carbon savings accounts. At this stage, specific actions identified include enhanced programming in the context of integrated watershed management planning program, afforestation (establishing new forest lands) and woodlot management (enhancing sequestration from existing forests). These actions provide sequestration benefits, while also enhancing a number of co-benefits within the context of the overall Climate and Green Plan.

Enhancing carbon sequestration monitoring systems will enable us to better estimate GHG removals into the future.

4R Nutrient Stewardship Program

The Climate and Green Plan notes the potential of a 4R Nutrient Stewardship program - Right Source @ Right Rate, Right Time, Right Place® - in reducing emissions and increasing economic profitability of farms.

Fertilizer Canada assessment¹⁰ indicates the following:

Research has shown that implementing 4R Nutrient Stewardship on the farm can result in up to an \$87/acre increase in returns to farmers. By implementing 4R Nutrient Stewardship at a basic level on the major crop rotations in Manitoba (canola, corn, spring and winter wheat, flaxseed, barley and oats), there is a potential GHG emission reduction of approximately 275,000 tonnes CO₂e per year.

The Canada Canola Growers Association included 4R Nutrient Stewardship in their list of sustainability targets with a goal to have 50% of canola production acres under 4R Nutrient Stewardship by 2025. If 50% of canola production acres in Manitoba applied advanced 4R practices, Manitoba is expected reduce GHG emissions by 130,000 tonnes per year. The Fertilizer Use Survey indicated that 75% of Manitoba canola growers or 2.3 million Manitoba canola acres are practicing basic 4R Nutrient Stewardship BMPs.

Low Carbon Government

Government business practices can serve a leadership role in market transformation for a low carbon economy. Adopting climate forward policies and practices creates certainty and confidence for business investment and establishes standards of practice and performance.

Low carbon government is included in the Climate and Green Plan as an initiative for government to lead by example and reduce its own carbon footprint.

This sector is typically defined as provincial and municipal government operations or the MUSH sector: municipalities, universities, schools, and hospitals. With the City of Winnipeg taking up such a large carbon footprint in the province, examining what can be done here is particularly important. Current estimates are that this sector accounts for about 480,000 tonnes of CO₂e annually. Buildings account for about 310,000 tonnes of CO₂e and vehicles about 170,000 tonnes. The government of Manitoba's own footprint is about 94,000 tonnes of this amount.

10 4R Climate Smart Strategy as a Solution for Greenhouse Gas (GHG) Emissions Reductions in Manitoba, Fertilizer Canada (2019).

Government operations refers to activities undertaken government to conduct business operations and includes:

- procurement of goods and services
- building design, construction, management and leasing
- fleet vehicle and equipment purchase, leasing and management
- Crown land management and leasing
- infrastructure operation and maintenance (water, transportation, etc.)
- information and communications technologies
- waste reduction and management

A number of initiatives are possible across government operations to reduce carbon emissions from the overall MUSH sector and advance low carbon government. These include: reducing energy demand, waste reduction, fuel switching, operational efficiencies, innovation, and green procurement. Tracking these activities as part of the government's performance management is essential to ensure value for money and cost-effective low carbon progress.

The EAC has set out a menu of possible initiatives it is recommending for consideration and implementation by the government. These are set out in Appendix V.

Building Codes and Energy Efficiency

Building codes are an area of shared jurisdiction between the federal and provincial governments. The federal government develops the National Energy Code for Buildings (NECB) which sets out the technical requirements for the energy efficient design and construction of new buildings and develops new energy efficiency requirements for new housing and small buildings.

The Manitoba government facilitates the adoption of the NECB and new energy efficiency requirements for housing and smaller buildings as part of the National Building Code (NBC) by regulation and is responsible for compliance and enforcement of the energy code in Manitoba.

The federal government is advancing towards even more stringent energy efficiency building codes. This includes:

- a path for "net-zero energy ready"¹¹ building codes by 2030, where the code commission process is now launched with technical committee work underway to publish a more stringent model energy code for buildings, including the net-zero energy ready code, in 2020;
- a possible retrofit code for existing buildings by 2022, to guide energy efficiency improvements that can be made when Canadians renovate their homes and buildings.

Manitoba's current code is as follows:

- For larger buildings (commercial/institutional) it is the 2011 NECB, which came into force on December 1, 2014.
- For low-rise houses and small buildings, it is the energy efficiency requirements under Part 9 of the 2012 NBC, which became effective on April 1, 2016.
- Recommendations have been made (but no decision yet made) to adopt either 2015 NECB or the 2017 NECB, which is the baseline code for future net-zero energy ready building codes, now being developed by the federal government.

¹¹ A net-zero energy building is a high performance building that combines superior standards in energy efficiency with renewable energy production to offset all of the building's annual energy consumption.

Both the 2015 and 2017 NECBs provide improvements to energy use and efficiency. They update standards for lighting, service water, HVAC systems, roofs, windows and doors, and other items.

Although Manitoba is not alone amongst provinces in continuing to apply the 2012 building codes, delays in adopting and implementing updated building codes will affect Manitoba's energy efficiency performance. More importantly, it will impact the amount of carbon emissions reductions desired under the recommended carbon savings account.

Clean Energy Exports and Manitoba's CSA

Not only is Manitoba Canada's cleanest province for on-grid electricity generation, it exports this clean energy to the United States. This reduces emissions in those American states because they do not need to use fossil fuels for energy generation. At present, those emissions reductions are not counted for Manitoba's carbon savings account; they accrue to the jurisdiction that imports our clean energy.

Similarly, the prospect of an east-west transmission line for clean energy between Manitoba and Saskatchewan, or even Alberta, would reduce emissions in our neighbouring provinces but not count towards Manitoba's CSA. This is no reason not to advance such a project. A clean energy transmission line in Western Canada would be good for all of Canada, helping to reduce emissions and provide cheaper, cleaner energy to more Canadians. It would provide ongoing export opportunities for Manitoba Hydro.

There is a need for a more complete consideration by the federal and provincial/territorial governments on how clean energy exports can be incorporated into emissions reductions outcomes in order to encourage such projects. Manitoba stands to gain by such an approach.

Recommendations

This section of our report sets out specific recommendations to establish Manitoba's first carbon savings account and the actions required to achieve the GHG emissions reduction goal. This should be the framework by which all provincial climate actions and emission reduction measures follow. The recommended CSA contains the following elements:

- A cumulative emissions reduction goal for the period 2018-2022;
- A series of specific emission reduction actions to be taken by Manitoba to achieve that goal; and
- A forecast based on modelling of where this will take Manitoba into subsequent CSA periods.

Additionally, the EAC is providing recommendations on the following:

- A list of actions (to be established and undertaken) that could be incorporated into the proposed first CSA period to achieve even larger reductions;
- Reinforcing steps to support the CSA and create more momentum for emissions reductions;
- Implementation steps necessary to put the CSA into effect and help meet the Climate and Green Plan's vision of making Manitoba the cleanest, greenest, and most climate resilient province.

Recommendations

A Carbon Savings Account Goal and Actions for 2018-2022

1. Manitoba should set a GHG emissions reduction goal of no less than 1 Mt of CO₂e cumulative emissions reductions. This would 'bend the carbon curve' in Manitoba once and for all and put the province on a sustained path for even greater emissions reductions in subsequent CSA periods.
2. The 1 Mt goal should be comprised initially of the set of specific emissions reduction actions set out in Appendix I.
3. Additional actions should be considered for inclusion based on the EAC's recommendations and then added as soon as practical to the CSA to ensure achieving or surpassing the 1 Mt CSA reduction goal, as set out in Appendix I.
4. Any shortfall in achieving the 1 Mt goal must be added to the subsequent CSA period as part of the 'debit' feature of the CSA to ensure there is no relaxation of effort in reducing emissions.

Reinforcing Steps for Carbon Reductions in Manitoba

1. Manitoba should adopt the National Energy Code for Buildings 2017 (NECB 2017) as a mandatory provincial regulation and align the provincial building code accordingly. Future building code improvements should be instituted on a regular, automatic basis and mandated into law after a certain date.
2. A 4R nutrient stewardship program should be designed for active implementation in the agriculture sector to improve farm management practices and reduce emissions.
3. Manitoba should take steps requiring developers to incorporate electric vehicle (EV) charging stations into all new residential and commercial development projects above a minimal size (and as part of major renovations).
4. Manitoba should explore the feasibility of adopting mandatory rules requiring a certain percentage of new motor vehicles sold in the province to be zero emission vehicles (ZEVs).

5. Building from the sector working groups' efforts, a working group should be established to develop policies and approaches to identify viable carbon sequestration opportunities in Manitoba and how they align with similar emerging opportunities in other provinces and regions.
6. In conjunction with the biofuel provisions included within the CSA, Manitoba should work toward the adoption of biofuel mandates for the various transportation subsectors at the highest percentages technically feasible for implementation in the next CSA period. This would help to establish new markets for agricultural products currently facing barriers to market access. Manitoba should then encourage other provinces and jurisdictions to adopt those higher mandates and purchase feedstock for biofuels from Manitoba thereby helping our economy grow.
7. To further integrate the Jobs Pillar of the Manitoba Climate and Green Plan with the government's Economic Development Strategy, a new low-carbon economy sector working group should be established to advise government and the EAC on policies and actions to foster low-carbon growth, investment, and job opportunities building on the province's clean energy brand.
8. As an example of this, the Small Business Venture Capital Tax Credit (SBVCTC) program should be opened up to junior mining companies that are exploring for and developing clean energy minerals in Manitoba such as lithium, cobalt and graphite.
9. Efficiency Manitoba has a key role in offering energy efficiency solutions to Manitoba businesses and consumers to reduce emissions. Ensuring this tool is used to its maximum potential in support of achieving the carbon emission reductions set out in the CSA is necessary. This will require ongoing coordination and alignment of approaches between the government's CSA and Efficiency Manitoba.
10. Manitoba should actively explore construction of an east-west transmission line for exporting clean energy to Saskatchewan.

Implementation Steps

1. The government should take steps to reinforce that achieving the CSA requires a 'whole-of-government' approach with a commitment by departments and agencies to supporting and aligning policy, programs, and initiatives with the CSA goal. This approach should be coordinated by the Climate and Green Plan Implementation Office.
2. Independent modelling of progress towards the CSA goal should be undertaken on an annual basis and be published as part of the government's annual progress report to the legislature under *The Climate and Green Plan Implementation Act*.
3. Federal government ministers and officials should be briefed on Manitoba's CSA to avoid duplication and overlap in effort by governments and secure the most cost-effective emissions reductions available for Manitobans.
4. A full-accounting CSA should be developed to include both carbon removals and clean energy exports in order to show the complete GHG reductions story for Manitoba.

CSA Consideration

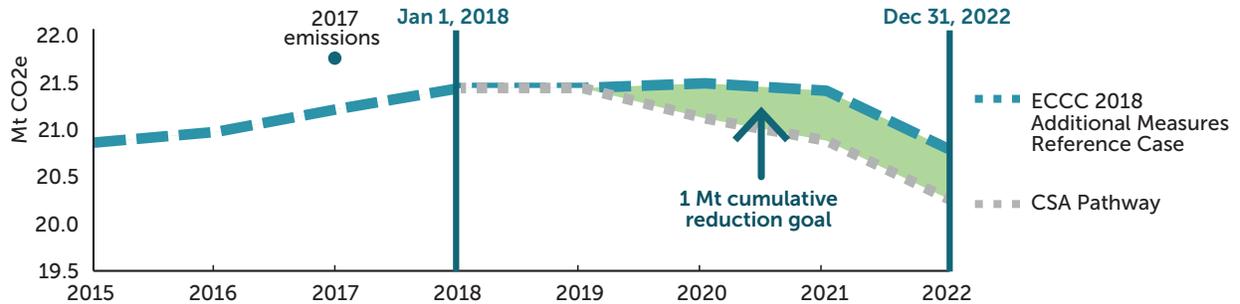
Achieving the 1 Mt cumulative emissions reduction goal would mean Manitoba's emissions would be lower at the end of the CSA period in 2022 than in the year before it started, in 2017. This would be the single-largest GHG emissions reduction by design in Manitoba's history.

CSA Pathway and Outcomes

The figures below represent independent modelling of the pathway to achieve the CSA goal of 1 Mt of cumulative emissions reductions from 2018-22. Two reference cases were modelled using an ECCC baseline and an independent modelling baseline. As can be seen below, both produce the 1 Mt of cumulative emissions reductions.

Using the ECCC 2018 Reference Case, Manitoba's emissions level in 2022 would be 20.3 Mt as can be seen in this figure.

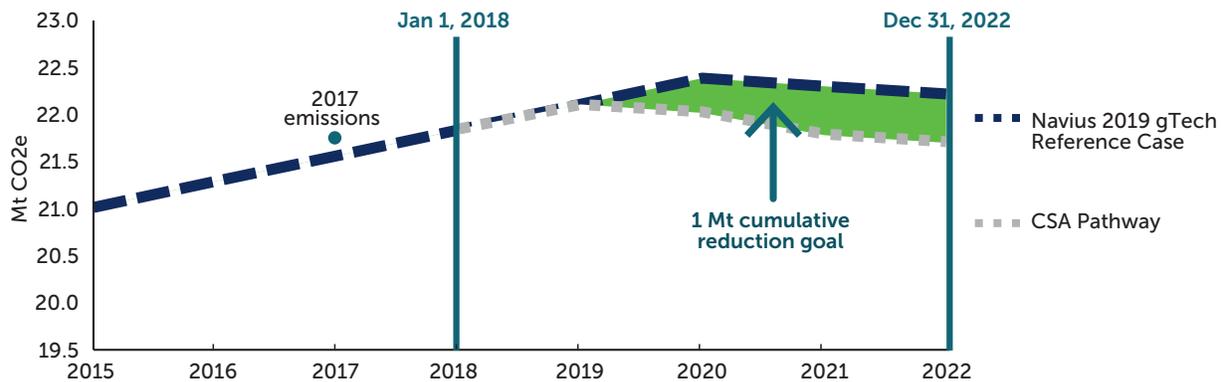
CSA Pathway - ECCC 2018 Additional Measures Reference Case



Data Source: 2018 Additional Measures Reference Case & Navius Research Inc. Forecast & Navius Research Inc. Modelling and Analysis 2019.

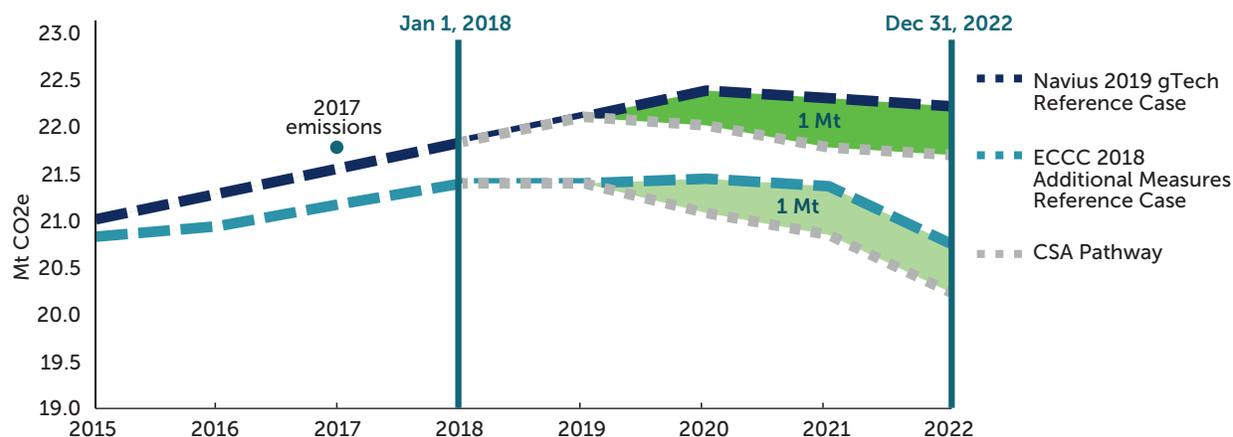
Using the EAC's independent modelling (using gTech), Manitoba's emissions level in 2022 would be 21.8 Mt, as can be seen in this figure.

CSA Pathway - Navius 2019 gTech Reference Case



Data Source: Navius Research Inc. Forecast & Navius Research Inc. Modelling and Analysis 2019.

CSA Pathway - Comparison of Reference Cases



Data Source: 2018 Additional Measures Reference Case & Navius Research Inc. Forecast & Navius Research Inc. Modelling and Analysis 2019.

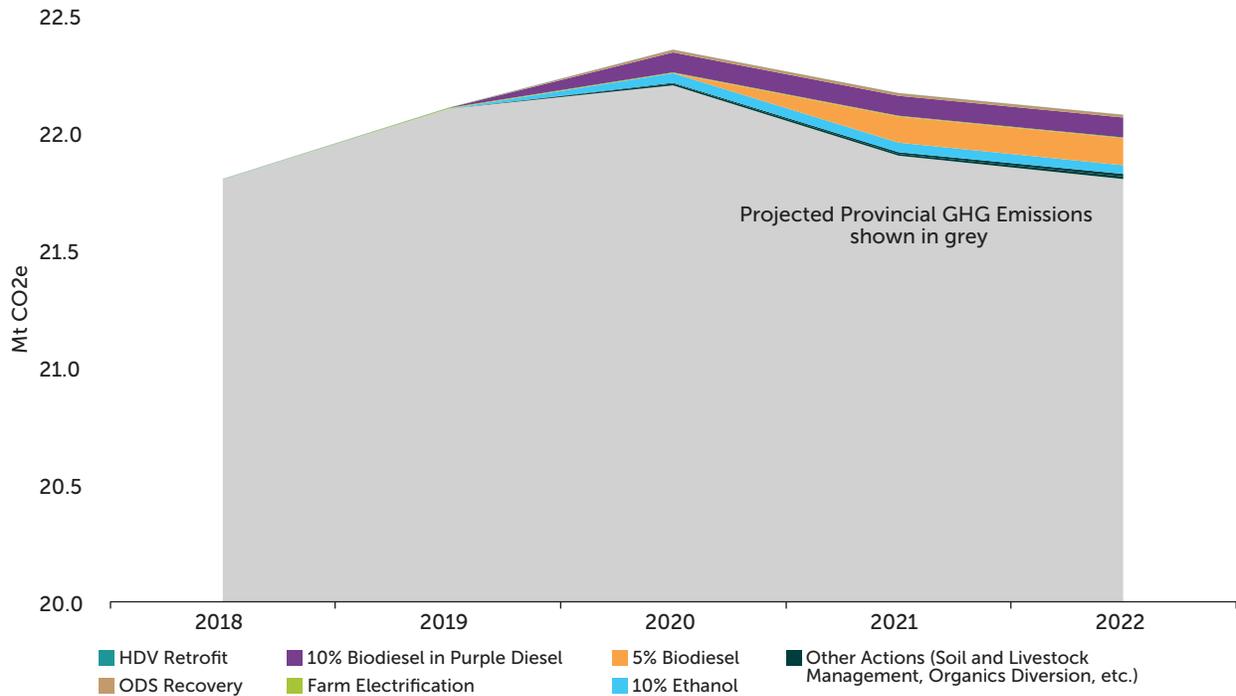
This typical difference in modelled outcomes shows why setting and focusing on the actual goal of cumulative emissions reductions makes sense for Manitoba.

The figure below shows the contribution of each action in reducing emissions over the first five-year CSA period of 2018-2022.

Note that under both the baselines shown in the figures above and below (the ECCC reference case and the independent modelling forecast), the business-as-usual forecasts include climate mitigation actions taken since the January 1, 2018 start of the of CSA period. For example, the baselines include Manitoba's early closure of its last coal-fired electricity generation station and federal carbon pricing. This means the 1 Mt reduction goal is additional to the emission reductions achieved in the same 2018-2022 period by these already established actions.

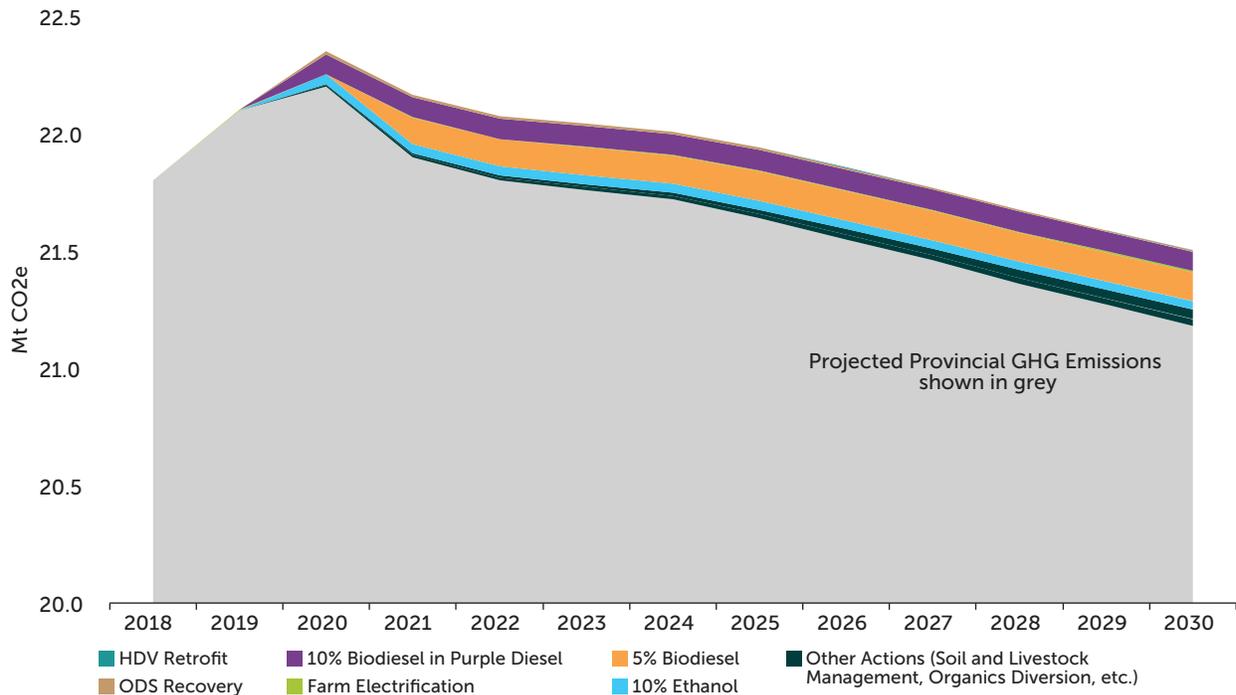
Also, the scenarios illustrated in the figures below do not include the potential impact of carbon sequestration measures or LULUCF measures. The sector working group assessment estimated emissions reduction potential of 55 kt in the 2018-2022 period, and as discussed earlier in the report, carbon sequestration actions should be undertaken. Any reductions achieved would be additional to those depicted in these figures as LULUCF emissions are not included in any of the business-as-usual baselines. This approach respects international accounting methodologies.

CSA Pathway – Scenario of Recommended Actions



The effect of these actions grows over time as they help keep emissions from rising after they are in place. They lead to greater emissions reductions over the longer-term as can be seen in the figure below.

Future CSA Pathway - Illustrative Scenario of Ongoing Impact of Action



Conclusion

A realistic GHG reduction goal and accounting foundation is the absolutely necessary first step in reducing GHG emissions in Manitoba. The aim is to put Manitoba on a sustained, downward path to reducing emissions. That means 'bending the carbon curve' once and for all. This must be the overarching objective of the first carbon savings account. The EAC believes its recommendations do just that.

Not all GHG reductions can happen at once. We need to reduce emissions while still growing the economy and moving it to a lower carbon footprint overall. This will neither be quick nor easy. But without a clear goal and pathway ahead, Manitoba will not make the progress it needs.

This report sets out that goal and pathway. It provides certainty to governments, business, and Manitobans as to what we must do and how we must do it. It fixes a five-year emissions reduction goal with a clear focus and commitment to achieve it. It establishes a base for adding to that goal with more actions as we measure and adjust our progress. That has not existed before in our province. This is the clear signal Manitobans need to move forward.

Tackling climate change requires all Manitobans to make the effort. This challenge will only get more urgent in the years ahead. This report will help our province meet that challenge.

Appendix I

Lists of Recommended Actions for Inclusion in CSA

TABLE 1: Recommended Initiatives to Achieve the 2018-2022 Reduction Goal

Initiative	Description	Policy Instrument	Estimated Emission Reductions 2018-2022 (ktCO ₂ e)*
5% Biodiesel Mandate	Manitoba was the first jurisdiction in Canada to establish a biodiesel mandate in 2009, and the mandate requires that diesel fuel sold in the province contain a minimum renewable content blend of 2% by volume. This initiative proposes an increase in the biodiesel mandate to a minimum renewable content blend of 5%.	Regulatory	200
10% Biodiesel in Purple Diesel Mandate	Manitoba was the first jurisdiction in Canada to establish a biodiesel mandate in 2009, and the mandate requires that diesel fuel sold in the province contain a minimum renewable content blend of 2% by volume. This initiative proposes an increase in the biodiesel mandate in marked diesel (which is predominantly used in the agricultural sector) to a minimum renewable content blend of 10% (regardless of whether the provincial blend requirement increased). This increased level of ambition compared to the overall provincial mandate could position Manitoba's agriculture sector as a leader in lower carbon intensity fuel, support the oilseed production industry, and further stimulate the biofuels industry in Manitoba through increased opportunities for local production of biodiesel.	Regulatory	200
10% Ethanol Mandate	Manitoba's current ethanol blending mandate is at 8.5%, which is the highest blending requirement in the country. This initiative proposes an increase in the ethanol mandate for gasoline sold at the pump in the province to 10%.	Regulatory	175
Demand-side Management Programs and Building Codes	This initiative is related to demand-side management (DSM) energy programs. Efficiency Manitoba is a newly created Crown Corporation with a mandate to develop and deliver DSM programs to achieve energy savings targets set in the <i>Efficiency Manitoba Act</i> of 1.5% of annual domestic electricity demand and 0.75% of annual domestic natural gas demand, over a 15-year period. Energy savings could be realized through energy code changes (established by government), product standards (established by government), mandatory energy disclosure and energy benchmarking, and demand-side management incentive programs.	Economic (Incentive) / Regulatory	135
Soil, Crops and Livestock Practices	The Ag Action Manitoba Program provides cost-shared funding support for on-farm beneficial management practices (BMPs), targeting a wide variety of environmental benefits including greenhouse gas mitigation. This initiative proposes an increase in program funding support for those BMPs (current and new) that offer substantial GHG mitigation potential to increase uptake, including: establishment of a cover crop (current); increasing frequency of perennials within annual crop rotations (current); perennial cover for sensitive lands (current); improved quality of pasture and forage-based diets (current); intercropping (current); and nitrogen fertilizer management (new).	Economic (Incentive)	70

TABLE 1: Recommended Initiatives to Achieve the 2018-2022 Reduction Goal

Initiative	Description	Policy Instrument	Estimated Emission Reductions 2018-2022 (ktCO₂e)*
Heavy-duty Vehicle Retrofits	Fuel efficiency is a means to achieve GHG emissions reductions in the transportation sector through This initiative proposes to create a fuel efficiency program for heavy duty vehicles, with cost-sharing rebates on the purchase of fuel saving technologies (retrofits).	Economic (Incentive)	60
Public Sector GHG Emissions Inventory	This initiative is a proposed GHG emission inventory for government-reporting entities (GRE) as a first step in emissions management. GREs include provincial departments, public housing, Crown corporations, post-secondary institutions, school divisions and health care institutions. The inventory would include fleet vehicle emissions, building emissions and electricity use for all facilities operationally controlled by these sectors.	Information	45
Whitegoods / ODS Recovery	This initiative proposes to reduce ozone-depleting substances (ODS) and GHG emissions by increasing the management of end-of-life white goods (e.g., fridges, freezers) with the intent of establishing Extended Producer Responsibility through a producer responsibility organization. Approximately 43,500 fridges and freezers reach end-of-life in Manitoba annually, and there are an unknown number of stockpiled units across the province that have not been recycled to the extent possible. The producer responsibility organization would optimize management (recycling and safe disposal) of all end-of-life whitegoods in the province including in northern and remote areas.	Economic (Incentive)	35
Agriculture Energy BMPs	The Ag Action Manitoba Program provides cost-shared funding support for on-farm beneficial management practices (BMPs), targeting a wide variety of environmental benefits including greenhouse gas mitigation. Current programming does not target GHG emissions from energy use. This initiative is a proposed expansion of program funding to support new energy-related on-farm BMPs that offer substantial GHG mitigation from improved energy efficiency or from switching away from fossil fuels to alternative energy sources. The new BMPs that are proposed include: energy efficiency retrofits (greenhouse facility improvements; heating and ventilation improvements to livestock facilities; grain drying upgrades); supply of biomass heat to displace fossil fuel heat; and on-farm electrification.	Economic (Incentive)	10
Electric Buses in Winnipeg	This initiative proposes adding an initial 20 electric buses to Winnipeg Transit's fleet with associated charging infrastructure.	Investment	5

TABLE 1: Recommended Initiatives to Achieve the 2018-2022 Reduction Goal

Initiative	Description	Policy Instrument	Estimated Emission Reductions 2018-2022 (ktCO ₂ e)*
Organics Diversion – Manitoba Composts Program	An estimated 30-40% of waste disposed in landfills in Manitoba is organic material. The Manitoba Composts Program was established under Manitoba's Waste Reduction and Recycling Support Program to support public and private sector composting operations to encourage the diversion of organic waste from landfills. The Manitoba Composts Support Payment is an incentive payment established under the Manitoba Composts Program, with support provided to public and private sector composting facilities that provide processing services for eligible organic waste from residential, industrial, commercial and institutional sectors. This initiative proposes to reach the goal of diverting 100,000 tonnes of organics annually by expanding operations at existing compost facilities and/or developing new compost facilities.	Economic (Incentive)	5
Electrifying Churchill (Displacing Propane)	The community of Churchill is predominantly dependent upon heating oil and propane for building heat, with the fuels typical shipped into the community by rail or marine transport. This initiative proposes the electrification of heat and displacement of propane heat systems for some townhouses. Fuel switching to clean renewable electricity can provide the following benefits: GHG emission reductions; improved energy affordability for the heating of public housing; and enhanced energy security in the supply of heat for homes in a northern community.	Investment	5
<i>Enhanced Carbon Sequestration Programming (Carbon Removal)**</i>	<i>This initiative proposes funding support for expanding existing programming aimed at carbon sequestration. The Conservation District provincial-municipal partnership program (transitioning to the Watershed District program) provides incentives to private and public entities for land management practice changes that improve watershed resiliency in Manitoba. Eligible BMPs include: planting grassed waterways; planting and distributing forage seed; riparian enhancements and restoration; planting shelterbelts; native grassland restoration; and soil health programs such as intercropping and composting.</i>	<i>Cooperative Management / Economic (Incentive)</i>	<i>50</i>
	<i>(**counted as part of Manitoba's LULUCF contribution)</i>		
<i>Afforestation (Carbon Removal)**</i>	<i>This initiative proposes to promote carbon sequestration through establishing new-forested lands (afforestation) on Crown land or private land such as marginal agricultural land, pasture, abandoned lands, degraded industrial lands such as mines or landfill sites, etc. In addition to large-scale block plantings, shelterbelt establishment and renewal could be an efficient and effective means of promoting carbon sequestration.</i>	<i>Investment / Cooperative Management</i>	<i>5</i>
	<i>(** counted as part of Manitoba's LULUCF contribution)</i>		

* Emissions reduction projections are intended to demonstrate order of magnitude and relative impact of each proposed initiative. Emission reductions are not cumulative as there are interactive effects among the initiatives.

TABLE 2: Additional Recommended Initiatives to Support Achieving the 2018-2022 Reduction Goal

Initiative	Description	Policy Instrument	Estimated Emission Reductions 2018-2022 (ktCO₂e)*
10% Biodiesel Mandate	Manitoba was the first jurisdiction in Canada to establish a biodiesel mandate in 2009, and the mandate requires that diesel fuel sold in the province contain a minimum renewable content blend of 2% by volume. This initiative proposes an increase in the biodiesel mandate to a minimum renewable content blend of 10%.	Regulatory	220
15% Ethanol Mandate	Manitoba's current ethanol blending mandate is at 8.5%, which is the highest blending requirement in the country. This initiative would increase the ethanol mandate for gasoline sold at the pump in the province to 15%.	Regulatory	180
4R Nutrient Stewardship	A Memorandum of Understanding exists between Fertilizer Canada, Keystone Agricultural Producers and the Government of Manitoba to promote 4R Nutrient Stewardship as the leading approach to sustainable nutrient beneficial management practices (BMPs) in the province. This initiative proposes to increase the promotion and integration of the 4R Nutrient Stewardship program including: recognizing 4R Nutrient Stewardship as the standard for proper nutrient management in Manitoba; recognizing voluntary actions undertaken to reduce environmental impacts through investments in research as well as accreditation and verification programming; adopting and supporting science-based decisions on matters related to nutrient management; identifying a 4R Nutrient Stewardship target for Manitoba; incentives to growers/grower organizations for implementing a 4R Plan with a 4R designated agri-retailer as opposed to single BMP adoption; working with landowners to incorporate requirements for a 4R Nutrient Stewardship plan.	Economic (Incentive) / Information	130

* Emissions reduction projections are intended to demonstrate order of magnitude and relative impact of each proposed initiative. Emission reductions are not cumulative as there are interactive effects among the initiatives.

TABLE 3: Initiatives Requiring Further Evaluation and Analysis (to be considered for future CSAs)

Initiative	Description	Policy Instrument	Estimated Emission Reductions 2018-2022 (ktCO ₂ e)*
20% Biodiesel in Purple Diesel Mandate	Manitoba was the first jurisdiction in Canada to establish a biodiesel mandate in 2009, and the mandate requires that diesel fuel sold in the province contain a minimum renewable content blend of 2% by volume. This initiative would propose an increase in the biodiesel mandate in marked diesel (which is predominantly used in the agricultural sector) to a minimum renewable content blend of 20% (regardless of whether the provincial blend requirement increased). This increased level of ambition compared to the overall provincial mandate could position Manitoba's agriculture sector as a leader in lower carbon intensity fuel, support the oilseed production industry, and further stimulate the biofuels industry in Manitoba through increased opportunities for local production of biodiesel.	Regulatory	430
Modal Shift and Strategic Transport Plan	As an urban centre, commuter hub, and home to 60% of Manitoba's population, the City of Winnipeg offers special opportunities to reduce transportation emissions. The proposed Modal Shift initiative, therefore, focusses on the City of Winnipeg and the Metropolitan Region, as a starting point, and is aligned with implementation of the Winnipeg Climate Action Plan transportation strategy. This initiative is designed to support systems and programs that help Manitobans to use the most sustainable mode of transport for each part of each journey. Less than 1% of Winnipeg's emissions arise from transit, whereas 32% are from personal vehicles. This proposal assumes multiple investments, new policies and regulations, education and awareness, etc. (transit services and facilities, cycling routes and sidewalks, bike racks, etc.). This initiative focused on modal transport, but should be considered as part of broader strategic transport plans to further consider GHG emission reductions, including through enhanced freight and goods movement.	Regulatory / Investment / Information	200
Flex Fuel Refueling Stations	Manitobans can currently choose gasoline that is premium (containing no ethanol), medium (containing up to 5% ethanol) or regular (containing up to 10% ethanol), and the vast majority of diesel users in Manitoba presently have access to only one grade of diesel fuel. There are no retail pumps in the province that provide higher renewable fuel blends such as E85 (for use in flex fuel gasoline vehicles) or B20 (for use in a most light, medium and heavy duty diesel vehicles), and consequently users do not have a choice to use fuels with higher renewable content blends. This initiative proposes to increase consumer access to medium and high renewable fuel blends by providing financial support to fuel marketers and retailers to install fuel pumps and tanks dedicated to higher blend fuels under a new renewable fuel access fund.	Investment	75
FeeEV	This initiative would introduce a fee on the purchase of new, inefficient light duty vehicles and use the revenue collected to provide a financial incentive for the purchase of new battery-electric vehicles. Through the program, a \$100 fee would be applied to the purchase of a new truck in Manitoba (in 2017, there were nearly 50,000 new truck sales in Manitoba). The revenue generated from the fee would be earmarked into an electric vehicle (EV) incentive fund, where consumers purchasing a new EV in the province would be eligible for a rebate valued at \$4000 per vehicle.	Economic (Incentive)	30

TABLE 3: Initiatives Requiring Further Evaluation and Analysis (to be considered for future CSAs)

Initiative	Description	Policy Instrument	Estimated Emission Reductions 2018-2022 (ktCO ₂ e)*
Off-grid Communities	Manitoba has four off-grid communities (not connected to the province's electricity grid) - Sayisi Dene (Tadoules Lake), Northlands (Lac Brochet), Shamattawa and Barren Lands (Brochet). These communities have diesel-fired generation for electricity and use heating oil for heat. Collectively they consume over 4.4 million litres of diesel fuel annually. The federal government is currently evaluating options for the reduction of diesel-fired generation in these communities, with input from provincial officials and others.	Investment	10
Electric Vehicle and Charging Incentive	This initiative would encourage the adoption of electric vehicles (EV) via an EV and charging station purchase incentive program. The incentive is currently valued at a maximum of \$7,500 per vehicle, \$750 per residential Level 2 charger, and \$1,500 per Level 2 charging point for workplace stations.	Economic (Incentive)	10
Coordinated Land Use Planning and Services	The Government of Manitoba released the findings of its planning, zoning and permitting review. Transparent plans are identified as supportive of efficient regulatory processes. Numerous findings were identified, including the need for unified planning across the Winnipeg Metropolitan Region, including single view of land, water and resource management and coordinated services. Coordinate planning of and use and services could reduce GHG emissions (e.g., transportation planning, etc.).	Economic Regulatory / Investment / Cooperative Management	TBD

* Emissions reduction projections are intended to demonstrate order of magnitude and relative impact of each proposed initiative. Emission reductions are not cumulative as there are interactive effects among the initiatives.

Appendix II

Sector Working Group Members

Transportation Sector Working Group

- Advanced Biofuels Canada
- Bison Transport
- Canadian Fuels Association
- CentrePort
- Efficiency Manitoba
- Electric Vehicle Technology and Education Centre - Red River College
- Federated Co-operatives Limited
- Functional Transit
- Global Automakers of Canada
- Green Action Centre
- Husky
- Manitoba Electric Vehicle Association
- Manitoba Heavy Construction Association
- Manitoba Hydro
- Manitoba Motor Dealers Association
- Manitoba Sustainable Development
- Manitoba Trucking Association
- New Flyer
- University of Manitoba
- Winnipeg Airport Authority
- Winnipeg Metropolitan Region
- Winnipeg Trails Association

Agriculture Sector Working Group

- Agriculture and Agri-Food Canada
- Boke Consulting
- Efficiency Manitoba
- Enterprise Machine Intelligence & Learning Initiative
- Federated Co-op Ltd.
- Fertilizer Canada
- International Institute for Sustainable Development
- International Plant Nutrition Institute
- Keystone Agricultural Producers
- Manitoba Agriculture
- Manitoba Beef Producers
- Manitoba Canola Growers
- Manitoba Conservation Districts Association
- Manitoba Forage and Grassland Association
- Manitoba Organic Alliance
- Manitoba Pulse and Soybean Growers
- Manitoba Sustainable Development
- Prairie Agriculture Machinery Institute
- Soil Conservation Council of Canada
- University of Manitoba

Buildings Sector Working Group

- American Society of Heating, Refrigerating and Air-Conditioning Engineers
- Building Owners and Managers Association of Manitoba
- Canada Mortgage and Housing Corporation
- Centre for Applied Research in Sustainable Infrastructure- Red River College
- Construction Association of Rural Manitoba
- Efficiency Manitoba
- Engineers Geoscientists Manitoba
- Manitoba Chapter of the Canada Green Building Council
- Manitoba Green Building Coordination Team
- Manitoba Home Builders Association
- Manitoba Housing Corporation
- Manitoba Real Estate Association
- Manitoba Sustainable Development
- Manitoba Sustainable Energy Association
- Office of the Fire Commissioner
- Sustainable Building Manitoba

Waste Sector Working Group

- City of Winnipeg
- Eco-West Canada & Manitoba Association of Regional Recyclers
- Green Action Centre
- Indigenous Services Canada
- Manitoba Ozone Protection Industry Association
- Manitoba Sustainable Development
- Multi-Material Stewardship Manitoba
- Overton Environmental Enterprises Inc.
- Retail Council of Canada
- Southern Chiefs' Organization
- Strategy Makers
- Winnipeg Metropolitan Region

Carbon Sequestration Sector Working Group

- Canadian Sphagnum Peat Moss Association
- Ducks Unlimited Canada
- International Institute for Sustainable Development
- Manitoba Conservation Districts Association
- Manitoba Forestry Association
- Manitoba Habitat Heritage Corporation
- Manitoba Sustainable Development
- Nature Conservancy of Canada
- Upper Assiniboine River Conservation District

Low Carbon Government Sector Working Group

- Association of Manitoba Municipalities
- City of Brandon
- City of Dauphin
- City of Selkirk
- City of Winnipeg
- Manitoba Association of School Board Officials
- Manitoba Finance
- Manitoba Health, Seniors and Active Living
- Manitoba Liquor & Lotteries
- Manitoba Sustainable Development
- Prairie Mountain Health
- University College of the North
- University of Manitoba
- University of Winnipeg
- Vehicle & Equipment Management Agency
- Winnipeg Regional Health Authority

Appendix III

Evaluation and Policy Frameworks

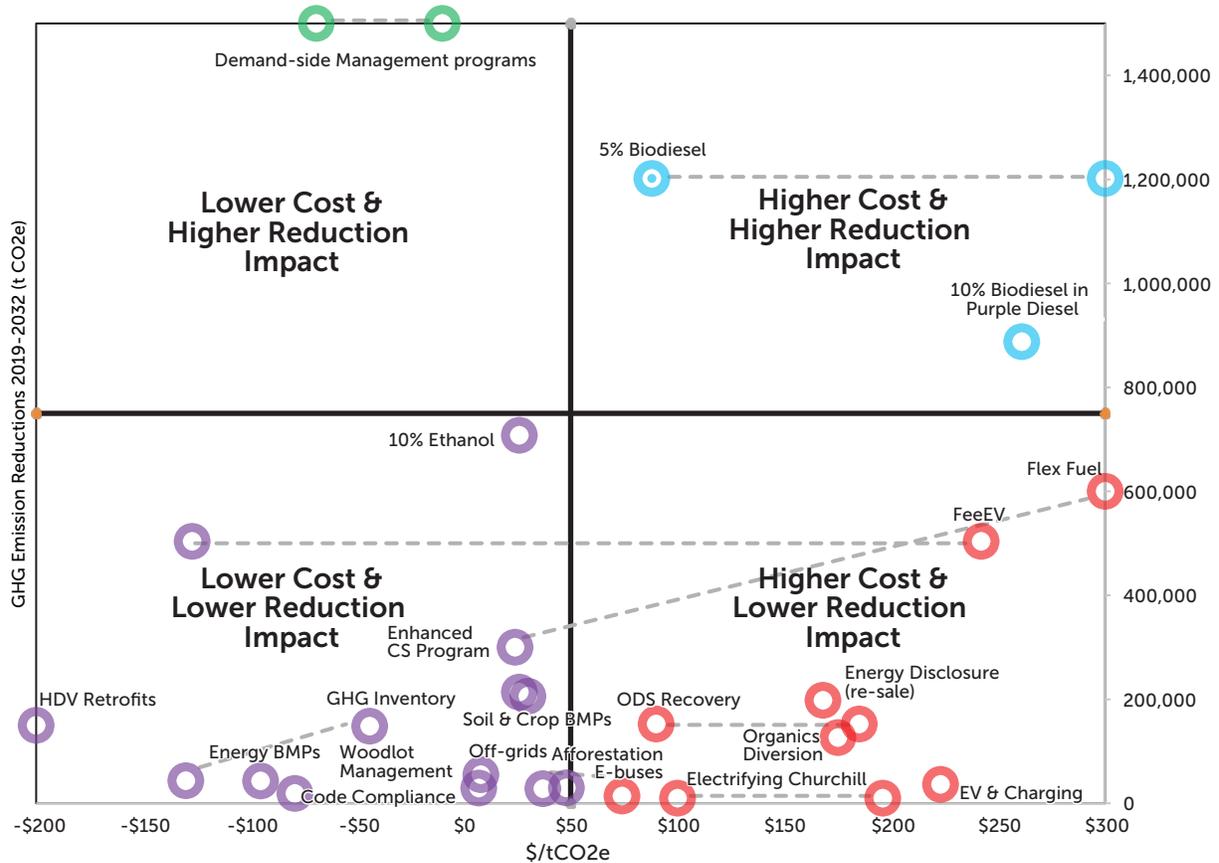
Evaluation Framework

Criteria	Measure
Effectiveness	The peak volume of annual GHG reductions from the policy/program
Cost	The impact of the policy/program to the provincial Treasury
Efficiency	The policy/program costs per tonne of CO ₂ e reduced
Stakeholder Acceptance	The extent to which key stakeholders support the policy/program
Implementation Complexity	The duration necessary to implement the policy/program
Funding Availability	The number of federal funds available to potentially leverage (e.g. LCEF, Green Infrastructure Bank)
Co-benefits	The number of Climate and Green Plan pillars the policy/program complements

Policy Instruments

Spectrum	Examples
Regulatory Instruments - Statutes, regulations and standards	<ul style="list-style-type: none"> - Technical or design specifications - Performance-based standards - Product bans or substance limits - Approvals and permits - Guidance and codes of practice
Economic Instruments - Market forces to motivate behaviour	<ul style="list-style-type: none"> - Pollution or product charges (fees, taxes, etc) - Royalties and user charges - Resource allocation trading (emissions, etc) - Deposit / refund systems - Incentives and subsidies (grants, loans, contracts, etc.)
Cooperative Management Instruments - Binding agreements	<ul style="list-style-type: none"> - Conservation easements - Negotiated agreements (covenants) - Challenge requirements (implementation strategies to meet targets)
Information Instruments - Disclosure and capacity building	<ul style="list-style-type: none"> - Education, awareness and outreach - Product labelling - Performance and environmental reporting - Performance awards
Voluntary Initiatives - Stewardship	<ul style="list-style-type: none"> - Environmental management systems (ISO, Responsible Care, etc.) - Collaboration / consensus approaches (partnerships) - Corporate social responsibility and voluntary reporting - Procurement standards

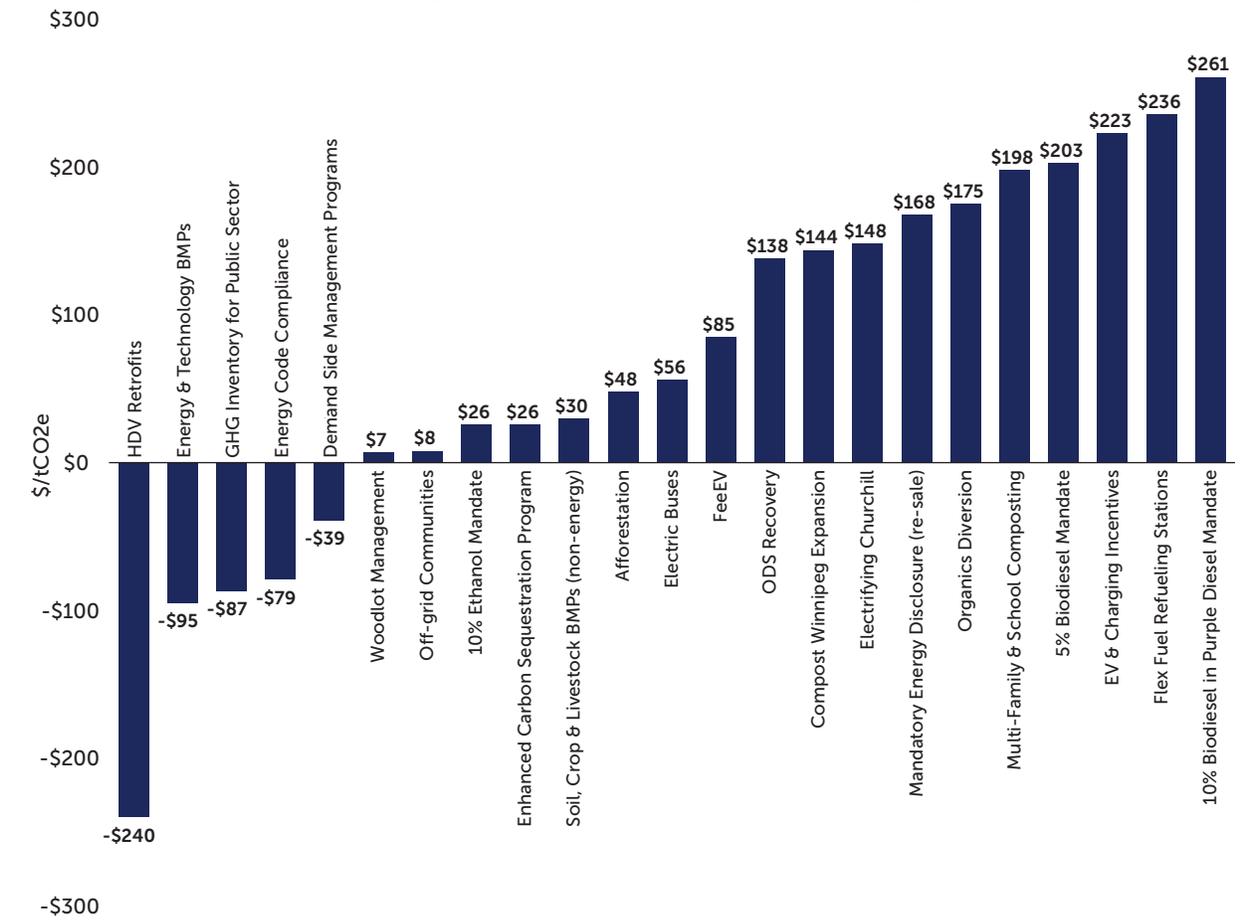
Evaluation of Potential Mitigation Opportunities - Effectiveness and Efficiency



Data Source: Sector Working Groups, 2019

Potential mitigation opportunities are plotted in four categories based on the evaluation framework effectiveness and efficiency criteria results. Each category is plotted in quadrants that are colour-coded. Potential initiatives with lower costs on a cost per tonne of emissions reduced basis (more efficient) are plotted in the left quadrants. Potential initiatives with a higher reduction impact in terms of cumulative GHG emissions reductions over the 2019 to 2032 period (more effective) are plotted in the top quadrants. Grey dotted lines between potential initiatives represent the range of results, depending on the assumptions considered in the evaluation framework assessment.

Evaluation of Potential Mitigation Opportunities - Efficiency



Data Source: Sector Working Groups, 2019

Appendix IV

Modelling Details

Model

The modelling was undertaken using a computable general equilibrium model established by Navius Research Inc. Navius works with numerous and diverse clients to evaluate national and provincial climate change strategies including British Columbia and Ontario.

The EAC used this model in two ways: first, to compare forecast results with those from ECCC across six different scenarios, and second, to identify cost-effective emissions reductions actions.

The Navius model is called gTech. It is an integrated energy-economy model, which combines a detailed representation of energy-related technologies with key economic transactions within the economy. Its combination of technological detail and macroeconomic completeness allows simulation of the effects of virtually various types of energy or climate policy on technology adoption, energy consumption, greenhouse gas emissions and the broader economy. The model:

- includes 12 regions of North America (all Canadian provinces and territories and the United States);
- balances supply and demand for 86 commodities and services in and across each region;
- simulates how households and businesses select technologies; and
- includes over 50 end-uses (e.g., process heat, clothes washer, manure management, etc.) and 200 technologies (including emerging technologies) to meet end-use demand across all sectors of the economy.

Assumptions

Modelling inherently has some degree of uncertainty, and associated outputs reflect the underlying assumptions. Assumptions related to future economic and population growth as well as assumptions related to policy that influences GHG emissions influence the baseline projections. The gTech model includes federal and provincial forecast information related to economic and population growth.

Notably, the baseline projection includes existing and established policies across Canada, including but not limited to carbon pricing.

Key assumptions include:

- GDP growth is 2% based on Finance Canada projections.
- Electricity demand increases to 25 TWh by 2022.

Navius Research Inc. Model Assumptions	2017	2018	2019	2020	2021	2022
GDP growth rate						
Total	2.0%	2.0%	2.0%	2.0%	1.9%	1.9%
<i>Transportation</i>	1.4%	1.4%	1.4%	1.4%	2.0%	2.0%
<i>Utilities</i>	0.6%	0.6%	0.6%	0.6%	0.0%	0.0%
<i>Resources</i>	1.1%	1.1%	1.1%	1.1%	3.0%	3.0%
<i>Manufacturing</i>	2.6%	2.6%	2.6%	2.6%	1.1%	1.1%
<i>Services</i>	2.1%	2.1%	2.1%	2.1%	2.1%	2.1%
<i>Construction</i>	1.3%	1.3%	1.3%	1.3%	1.6%	1.6%
Crude Oil (2010\$ per barrel)	76.0	73.3	70.5	67.8	69.2	70.6
Natural Gas (2010\$ per mmBTU)	3.8	3.7	3.5	3.3	3.4	3.6
Electricity demand (PJ)	86.1	87.1	88.1	89.1	89.6	90.1
Carbon price Nominal \$/t CO ₂ e	n/a	n/a	20	30	40	50

For comparison purposes, the assumptions in gTech are comparable to those included in the Environment and Climate Change Canada's reference case forecasts. Canada's model generally includes macro-economic data from: Finance Canada's annual economic statements and long-term economic projections; population growth from Statistics Canada projections; and oil and natural gas prices and production for the National Energy Board's projections.

Appendix V

Low Carbon Government Initiatives

Asset Management	Examples of Initiatives
<p>i. Reduce Energy Demand</p> <p>Demand for fossil fuel consumption can be reduced by maximizing the efficiency of existing assets through management practices. Fine-tuning the existing infrastructure (buildings, intersections, highways etc.) and removing wasted capacity can stimulate reductions in GHG emissions and are less cost intensive.</p>	<ul style="list-style-type: none"> - Install automated tracking on fleet vehicles - Right-size the GoM vehicle fleet (remove underutilized heavy-duty and light-duty vehicles from the fleet) - Install building automation systems to ensure optimal operation of systems (HVAC) - “Shutdown” non-essential buildings during holidays - Adopt climate friendly specifications when acquiring new assets
<p>ii. Waste Reduction</p> <p>Solid waste generation due directly to government operations or contracted services are not typically managed or tracked. While to volumes are not large, GoM does business with a large part of the market and represents an opportunity to lead or influence how solid waste is managed in multiple sectors.</p>	<ul style="list-style-type: none"> - Construction waste management for new buildings and renovations - Recycling services on Manitoba Housing properties - Awareness program to reduce contamination of recyclables - Divert biomedical waste from incineration
<p>iii. Fuel Switching</p> <p>Fuel switching for owned assets can be effective to demonstrate government leadership and for GHG emission reductions, but are potentially more complicated and costly. Electrification is not the only approach - propane to natural gas, biomass, or geothermal to heat buildings would also reduce GHG emissions.</p>	<ul style="list-style-type: none"> - Evaluate fuel-switching opportunities during asset maintenance or replacement - Convert buildings from propane to natural gas - Increase biofuels blends in fleet vehicles - Install EV charging stations at government buildings and rural areas
<p>iv. Crown land management practices</p> <p>Best management practices to reduce and sequester emissions – forestry, agriculture – in leases and GoM operations.</p>	

Policies and Practices		Examples of Initiatives
i. Operational policies	How GoM employees operate assets impacts emissions can impact emissions. Setting operating policies paired with monitoring compliance within the asset is a visible and inexpensive measure.	<ul style="list-style-type: none"> - Establish maximum allowable speed for GoM vehicles - Reduce vehicle idling - Migrate paper mail service to email-encrypted delivery of standard government documentation - Electronic bid systems , digital records management
ii. Support Innovation	New and innovative services, products and materials exist in Manitoba but often struggle with access to contracts and sales. The opportunity to access innovation can benefit government operations and support local business development. Initiatives focus on testing and incubating innovative practices and technology in the development, operation and maintenance of Manitoba assets.	<ul style="list-style-type: none"> - Build Net Zero demonstration house to test best technologies for new builds and demonstrate leadership - Partner with academic intuitions to promote research
iii. Procurement requirements and processes	Manitoba procures a relatively significant value of goods and services on a continual basis. Each purchase has the potential to communicate and demonstrate Manitoba's commitment to the vision of the Climate and Green Plan. Initiatives focus on sustainable specifications and market leverage.	<ul style="list-style-type: none"> - Require reporting on services or commodities that have GHG implications - Reduce purchase of single use goods
Reporting and Performance Metrics		Examples of Initiatives
i. Tracking, reporting and Balanced Scorecards	Fulfill tracking and reporting requirements of <i>The Climate and Green Plan Implementation Act</i> and Balanced Scorecard initiatives to provide transparency and report progress to achievement of outcomes.	<ul style="list-style-type: none"> - Fulfil reporting requirements outlined in <i>The Climate and Green Plan Implementation Act</i> - Tracking and reporting on fuel use data across the GoM fleet

Appendix VI

GHG Forecasts Under Various Baseline Reference Cases and Actual Emissions

Megatonnes Co2e	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
ECCC 2015 Reference Case	20.8	21.4	20.9	21.1	21.2	21.4	21.5	21.7	21.8	22.2	22.4	22.6	22.8	23.0
ECCC 2017 Reference Case	20.4	20.6	20.8	20.8	20.9	20.9	20.9	21.0	21.2	21.2	21.2	21.2	21.3	21.3
ECCC 2017 Additional Measures Reference Case (includes carbon pricing)	20.1	20.3	20.5	20.8	20.7	20.6	20.4	20.3	20.2	20.2	20.1	20.0	20.0	19.9
ECCC 2018 Reference Case	20.2	21.0	20.9	20.8	20.9	21.2	21.4	21.6	21.8	21.7	21.8	21.8	21.7	21.7
ECCC 2018 Additional Measures Reference Case (includes carbon pricing)	20.2	21.0	20.9	20.8	20.9	21.2	21.4	21.4	21.5	21.4	20.8	20.7	20.5	20.4
Navius 2019 gTech Reference	19.9	20.3	20.7	21.0	21.3	21.6	21.8	22.1	22.4	22.3	22.2	22.1	22.1	22.0
NIR 2019 (Emissions)	20.2	20.9	20.8	20.6	21.0	21.7	-	-	-	-	-	-	-	-

Appendix VII

Glossary of Terms

Term	Definition
4R Nutrient Stewardship	A stewardship program that has four principles (Right Source @ Right Rate, Right Time, Right Place®) to help improve nutrient management of fertilizer use in farming practices.
Biofuel	Fuel derived from biomass or organic matter for energy purposes, such as transportation or heating fuel.
Carbon dioxide equivalent (CO ₂ e)	Term used to describe different gases in a common unit, equivalency to carbon dioxide (CO ₂).
Carbon savings account	Part of the Made-in-Manitoba Climate and Green Plan to drive emission reductions for the province. It is the sum of all emission reductions over a five-year period on a cumulative basis.
Carbon sequestration	It is the process of capturing and storing carbon dioxide. It is usually a long-term storage of carbon in plants, soils, geologic formations, and the ocean.
Carbon sink	A natural reservoir, such as a forest, ocean, that absorbs and stores carbon dioxide from the atmosphere.
Carbon tax	A fiscal policy tool used by governments that applies a charge on the greenhouse gas content of fossil fuels.
Clean Fuel Standard	A Government of Canada policy designed to reduce emissions from liquid, gaseous and solid fuels used in transportation, industry and buildings. The policy has a target of reducing 30 million tonnes of CO ₂ e annually by 2030.
Cumulative emissions	Described as the total sum of GHG emissions within specific time period.
Demand-side management	Initiatives or technologies designed to encourage consumers lower their energy consumption.
Emissions-intensive, trade-exposed (EITE)	Industries with high levels of emissions relative to volume of output and vulnerable to outside competitors.
Fuel switching	Displacing or changing one fuel type for another. Usually switching from fossil fuels to non-fossil fuel sources.
Forecast	Modeling results used to predict future outcomes, such as GHG emissions.
Gross domestic product	The measure of the total output of goods and services of a given country.
Greenhouse gas (GHG)	Atmospheric gases which absorbs and re-emits heat, and include water vapor (H ₂ O), carbon dioxide (CO ₂), methane (CH ₄), nitrous oxide (N ₂ O), ozone (O ₃), chlorofluorocarbons (CFCs), and hydrofluorocarbons (includes HCFCs and HFCs).

Term	Definition
Intergovernmental Panel on Climate Change (IPCC)	A United Nations body for assessing the science related to climate change.
Kilo/Mega/tonnes	Metrics for measuring GHG emissions, usually for carbon dioxide (CO ₂) or carbon dioxide equivalent (CO ₂ e).
MUSH	Acronym used to group municipalities, universities, schools and hospitals.
Net Zero	A home or system that produces as much energy as it consumes on an annual basis.
Per capita	A metric used to denote on a per-person basis.
Reference case	The scenario used as a baseline to measure additional actions or programs against and analyze changes in outcomes.
Reference year	The year used as a starting point to measure progress against.
Scenarios	Used in economic modelling to analyze possible future outcomes by considering alternative possible measures or actions. A scenario analysis can demonstrate several possible future outcomes.
Small Business Venture Capital Tax Credit	A Government of Manitoba incentive that provides a non-refundable provincial tax credit of up to 45% to individuals and corporations who acquire equity capital in eligible Manitoba enterprises.

Appendix VIII

EAC Members and Bios

Colleen Sklar, *Chair*

Colleen Sklar is the Executive Director of the Winnipeg Metropolitan Region where she works collaboratively with local leaders from across Manitoba to develop integrated regional responses and innovative approaches to land use planning, infrastructure investment, economic development, water management and protection to allow our growing communities to meet the demands of the future. Colleen is an IAP2 Certified Community Consultant, a recipient of the Queen Elizabeth Diamond Jubilee Medal for her volunteer work and acted in the capacity of vice-chair on the Lake Manitoba Flood Appeal Commission for the Province of Manitoba.

Dennis Anderson, *BSc, MBA, PhD*

Dr. Dennis Anderson (Gimli) served 10 years as President of Brandon University (BU). Prior to joining BU, he was marketing professor and Associate Dean of Asper School of Business at the University of Manitoba. He conducted a number of research studies for the federal government and utility organizations focused on consumers' energy consumption behaviour, attitudes, and preferences. And he completed numerous applied research studies and consultations for private and public organizations on the marketing feasibility of new products and services.

Ian Gillies

Now retired, Ian Gillies (Winnipeg) had a thirty-year career with Cargill Limited, where he served in various management roles from 1984-2013. He holds a master of natural resource management from the University of Manitoba and has served on the Clean Environment Commission since 2016.

Karla Guyn

Karla Guyn (Lockport) is the CEO of Ducks Unlimited Canada. Prior to assuming the role of CEO, she held several senior leadership positions with Ducks Unlimited Canada over her 22-year career with the organization. This included serving as the national director of conservation (2013 – 2016) and director of conservation planning (2006-2013). She is recognized as a North American conservation leader, serving on international committees including the North American Waterfowl Management Plan and the Sustainable Forestry Initiative. Karla holds a masters of Science and a PhD from the University of Saskatchewan.

Jim Irwin

Jim Irwin (Lake Audy) is the owner of Experiential Tourism Strategies Consulting. From 1984-2015, he operated Riding Mountain Guest Ranch. Mr. Irwin holds a bachelor of science, a master of science and a PhD. His areas of expertise include ecology, wildlife and resource management and wildlife diseases. He also serves as chair of the Riding Mountain UNESCO World Biosphere Reserve.

Andrew MacSkimming, *Vice-Chair*

Andrew MacSkimming (Winnipeg) is a lawyer and owner of A.H MacSkimming Law Office. He has been a practicing lawyer since 2005 and has also worked as a Senior Policy Advisor for the federal Office of the Minister of the Environment (2006-2007). Prior to that he worked as a lawyer and articling student with Environment Canada Legal Services and as a Research Analyst with a leading energy consulting and brokerage firm. Mr. MacSkimming has also served in a variety of public roles including as Chair of the Manitoba Bar Association's Environmental, Energy and Resources Law Section. He holds an LL.M. or Master of Laws in Environmental Law (2004).

Dimple Roy

Dimple Roy (Winnipeg) is a director with the International Institute for Sustainable Development, where she has worked in various capacities since 2008. Ms. Roy provides research leadership, policy analyses, and management functions on issues related to sustainable development in the context of people, land, water and agriculture in Canada and globally. She is also a former policy analyst for Manitoba Conservation (2005-2006).

Laurie Streich

Laurie Streich (Winnipeg) retired from government in 2015. She served in many environment-related positions during her career, including her role as director of the pollution prevention branch of the former department of Manitoba Conservation. Ms. Streich has been a member of the Clean Environment Commission since 2016.

David McLaughlin, *Technical Advisor to the EAC*

David McLaughlin (Ottawa) MA, MBA, is one of Canada's leading climate and sustainability experts. He is currently director, climate change for the International Institute for Sustainable Development. He is the former president and CEO of the National Round Table on the Environment and the Economy. He was senior advisor, climate change in the Manitoba government. Mr. McLaughlin served in the New Brunswick government as deputy minister for policy and planning, secretary to the Cabinet Committee on Policy and Priorities, and Intergovernmental Affairs. He was chief of staff to the Prime Minister of Canada, the Premier of New Brunswick, and federal Minister of Finance.