Court of Appeal File No.: **C65807**

COURT OF APPEAL FOR ONTARIO

IN THE MATTER OF A REFERENCE to the Court of Appeal pursuant to section 8 of the *Courts of Justice Act*, RSO 1990, c. C.34, by Order-in-Council 1014/2018 respecting the constitutionality of the *Greenhouse Gas Pollution Pricing Act*, Part 5 of the *Budget Implementation Act, 2018, No. 1*, SC 2018, c. 12

RECORD OF THE ATTORNEY GENERAL OF ONTARIO

VOLUME III OF IV

THE ATTORNEY GENERAL OF ONTARIO
Constitutional Law Branch
720 Bay Street, 4th Floor
Toronto, ON M7A 2S9

Josh Hunter / Padraic Ryan / Thomas Lipton
LSO Nos.: 49037M / 61687J / 60776V
Tel.: (416) 326-3840 / (416) 326-0131 / (416) 326-0296
Fax: (416) 326-4015
E-mail: joshua.hunter@ontario.ca / padraic.ryan@ontario.ca / thomas.lipton@ontario.ca

Counsel for the Attorney General of Ontario

TO: DEPARTMENT OF JUSTICE CANADA
Prairie Regional Office (Winnipeg)
301-310 Broadway
Winnipeg, MB R3C 0S6

Sharlene Telles-Langdon
Tel.: (204) 983-0862
Fax: (204) 984-8495
E-mail: sharlene.telles-langdon@justice.gc.ca

Counsel for the Attorney General of Canada

AND TO: **SASKATCHEWAN MINISTRY OF JUSTICE**
Constitutional Law Branch
820-1874 Scarth Street
Regina, SK S4P 4B3

P. Mitch McAdam, Q.C. / Alan Jacobsen
Tel.: (306) 787-7846
Fax: (306) 787-9111
Email: mitch.mcadam@gov.sk.ca / alan.jacobsen@gov.sk.ca

Counsel for the Attorney General of Saskatchewan

TABLE OF CONTENTS

VOLUME I

TAB	DOCUMENT	PAGES
1.	Order in Council 1014/2018 ……	1
2.	Order of Strathy CJO dated August 8, 2018 ……	5
3.	Order of MacPherson JA dated August 30, 2018 ……	7
4.	Ontario, *Preserving and Protecting our Environment for Future Generations: A Made-in-Ontario Environment Plan* (29 November 2018) ……	13
5.	Ontario, *Ontario's A Plan for the People* (15 November 2018) …….	67
6.	Letter from the Hon. Rod Phillips to the Hon. Catherine McKenna (15 August 2018) ……..	241
7.	Letter from the Hon. Catherine McKenna to the Hon. Rod Phillips (29 August 2018) ……..	243
8.	Letter from the Hon. Rod Phillips to the Hon. Catherine McKenna (30 August 2018) …….	245
9.	Letter from the Hon. Catherine McKenna to the Hon. Rod Phillips (8 November 2018) ……..	247
10.	Letter from the Hon. Rod Phillips to the Hon. Catherine McKenna (19 November 2018) ……	249
11.	Letter from Hon. Rod Phillips to the Hon. Catherine McKenna (28 November 2018) ……	251
12.	Ontario, News Release, "Ontario Releases Plan to Protect the Environment" (29 November 2018) …….	253

VOLUME II

13.	Ontario, *Ontario's Climate Change Update 2014* (2014) ……	255
14.	Canada, *Clean Growth and Climate Change* (26 October 2018) ……	297
15.	Ontario, *Long Combination Vehicle (LCV) Program* (2009) ……..	303
16.	Ontario, *Greener diesel regulation* (14 October 2015) ……	305

17. Infrastructure Ontario, *Highway 401 Expansion Project* (2018) ……. 309

18. Ontario, *Ministry review of the Gardiner Expressway and Lake Shore Boulevard East reconfiguration environmental assessment* (22 June 2017) ……. 313

19. Infrastructure Ontario, *Regional Express Rail – Davenport Diamond Rail Grade Separation* (2018) …… 393

20. Ontario, *High speed rail* (23 October 2017) …… 399

21. Infrastructure Ontario, *Hurontario Light Rail Transit* (2017) ……. 413

22. Ontario, *Report greenhouse gas (GHG) emissions* (20 March 2014; 13 September 2018) ……. 419

23. Ontario, *2014 Energy consumption and greenhouse gas emission report* (15 March 2016) …… 433

24. Ontario, *Responding to the Challenge of Climate Change* (2017) ….. 453

25. Ontario, *The Ontario Culture Strategy: Telling our stories, growing our economy* (20 July 2016) ……. 473

26. Ontario, *Building with wood* (1 November 2017) …… 505

27. Ontario, *Handling excess soil* (16 April 2018) …… 511

28. Ontario, *Afforestation* (16 June 2017) …….. 517

29. Ontario, *Forest sector's use of fossil fuels* (16 June 2017) …….. 523

30. Ontario, *Landfill gas capture: a guideline on the regulatory and approval requirements for landfill gas* (18 May 2016) …… 529

31. Ontario, *Food and Organic Waste Framework* (30 April 2018) ……. 547

32. Ontario, *Waste management* (28 November 2014) ……. 587

33. Environment and Climate Change Canada, *National Inventory Report 2018*, Table A11-12: 1990-2016 GHG Emission Summary for Ontario (2018); Table A13-7: Electricity Generation and GHG Emission Details for Ontario …… 593

34. Canada, *Actions to reduce emissions* (23 October 2018) ……. 675

35. Specific Mitigation Opportunities Working Group, *Final Report* (2016) …… 677

VOLUME III

36. British Columbia, *Climate Leadership Plan* (August 2016) …… 887

37. Alberta, *Climate Leadership Plan: Progress Report* (2017) …… 939

38. Saskatchewan, *Prairie Resilience* (4 December 2017) …… 1053

39. Manitoba, *Climate and Green Plan* (2017) ……. 1067

40. Quebec, *Québec in Action: Greener by 2020* (2012) …….. 1131

41. New Brunswick, *Transitioning to a Low-Carbon Economy* (December 2016) …… 1197

42. Prince Edward Island, *Taking Action* (11 May 2018) …….. 1223

43. Nova Scotia, *Towards a Greener Future* (January 2009) …… 1255

44. Newfoundland and Labrador, *Charting our Course* (2011) …… 1303

45. Yukon, *Climate Change Action Plan* (February 2009) …… 1387

46. Northwest Territories, *2030 NWT Climate Change Strategic Framework* (1 June 2018) …… 1435

47. Nunavut, *Climate Change Adaptation Planning: A Nunavut Toolkit* (March 2011) …… 1543

VOLUME IV

48. Canada, *Equality + Growth: A Strong Middle Class* (27 February 2018) ……. 1573

49. Canada, News Release, "Government of Canada fighting climate change with price on pollution" (23 October 2018) ……. 1943

50. Canada, Department of Finance, "Backgrounder: Ensuring Transparency" (23 October 2018) …… 1947

51. Canada, *Ontario and pollution pricing* (11 November 2018) …… 1953

52. Canada, *House of Commons Debates*, 42nd Parl., 1st Sess., Vol. 148, No. 279 (16 April 2018) at 18317 …… 1959

Climate Leadership Plan

AUGUST 2016

BRITISH COLUMBIA

Climate Leadership Plan

AUGUST 2016

For more information visit the website:
gov.bc.ca/ClimateLeadership

COPYRIGHT © 2016, PROVINCE OF BRITISH COLUMBIA. ALL RIGHTS RESERVED. THIS MATERIAL IS OWNED BY THE GOVERNMENT OF BRITISH COLUMBIA AND PROTECTED BY COPYRIGHT LAW. IT MAY NOT BE REPRODUCED OR REDISTRIBUTED WITHOUT THE PRIOR WRITTEN PERMISSION OF THE PROVINCE OF BRITISH COLUMBIA.

PRODUCTION OF THIS DOCUMENT INCLUDED ENVIRONMENTALLY FRIENDLY BEST PRACTICES. PLEASE REDUCE, REUSE AND RECYCLE.

Table of Contents

B.C.'S VISION FOR CLIMATE LEADERSHIP 2

CLIMATE LEADERSHIP PLAN AT A GLANCE 5

PATHWAY TO THE PLAN 7

CLIMATE CHANGE IS HAPPENING 8

BRITISH COLUMBIA IS TAKING ACTION 9

THE CLIMATE LEADERSHIP TEAM 10

PUBLIC AND STAKEHOLDER ENGAGEMENT 11

PROGRESS TO 2050 TARGET 12

ACTION AREAS 14

ACTION AREA: NATURAL GAS 15

ACTION AREA: TRANSPORTATION 18

ACTION AREA: FORESTRY AND AGRICULTURE 22

ACTION AREA: INDUSTRY AND UTILITIES 28

ACTION AREA: COMMUNITIES AND BUILT ENVIRONMENT 34

ACTION AREA: PUBLIC SECTOR LEADERSHIP 40

NEXT STEPS ON CLIMATE LEADERSHIP 44

APPENDIX 46

SUMMARY OF ACTION AREAS 46

B.C.'s Vision for Climate Leadership

British Columbians are proud to be recognized worldwide as leaders in the fight against climate change. We have proven that you can cut emissions while creating jobs.

In 2008, the Province released our Climate Action Plan and the world took notice. Since then it has provided us with the foundation we needed to reach our first target to reduce greenhouse gas (GHG) emissions to 6 per cent below 2007 levels by 2012.

We knew then that carbon pricing had to be central to any plan to fight climate change. That is why British Columbia was the first jurisdiction in North America to introduce a broad-based, revenue-neutral carbon tax. We knew we had to get our own public sector emissions in order before asking industry and the general public to do the same, so we implemented our Carbon Neutral Government legislation. Along with California, we were also the first to implement a low carbon fuel standard.

Our plan recognized that there were fundamental policies that everyone had to get going on — like addressing the emissions that come from our built environment, helping buyers afford low-emission, electric and hydrogen fuel cell vehicles, and preparing our province for climate change with an adaptation strategy.

Since 2011, I have had the honour to serve as British Columbia's Premier, and I am proud to say we have continued this passionate commitment to fighting climate change through actions such as: renewing the Clean Energy Vehicle program; expanding the Carbon Neutral Capital Program to health authorities and public post-secondary institutions; providing funding for energy efficiency improvements in our local governments and First Nations; and working with partners here in Canada and the U.S. on initiatives to fight climate change.

Through these actions and others, British Columbia has demonstrated that we can reduce emissions while continuing to grow the economy and create jobs. We are already seeing proof — our province now has over 60,000 clean economy jobs.

Today, we continue to build on the work we started in 2008 by launching our new Climate Leadership Plan. While our 2008 strategy laid the foundation for large scale change, we are now developing a strategy to add targeted, coordinated, sector-specific actions. We started by consulting with experts and listening to British Columbians. Now we are taking action with an approach that recognizes that real sustainability means balancing environmental concerns with social and economic issues, such as affordability and job creation.

B.C. has the highest and most comprehensive carbon tax in North America. As climate leaders, we know we can achieve more working together with Canada's provinces, territories and the federal government, while respecting each other's jurisdictions. We support the adoption of B.C.'s price on carbon as a national benchmark, and increasing that price together in an effective and affordable way, once others catch up.

Revenue neutrality remains the core principle of British Columbia's carbon tax. The carbon tax can only increase if every dollar is returned to citizens in the form of tax relief. In that way, we tax the pollution we don't want and use the money for what we do want — money in people's pockets, jobs and opportunity.

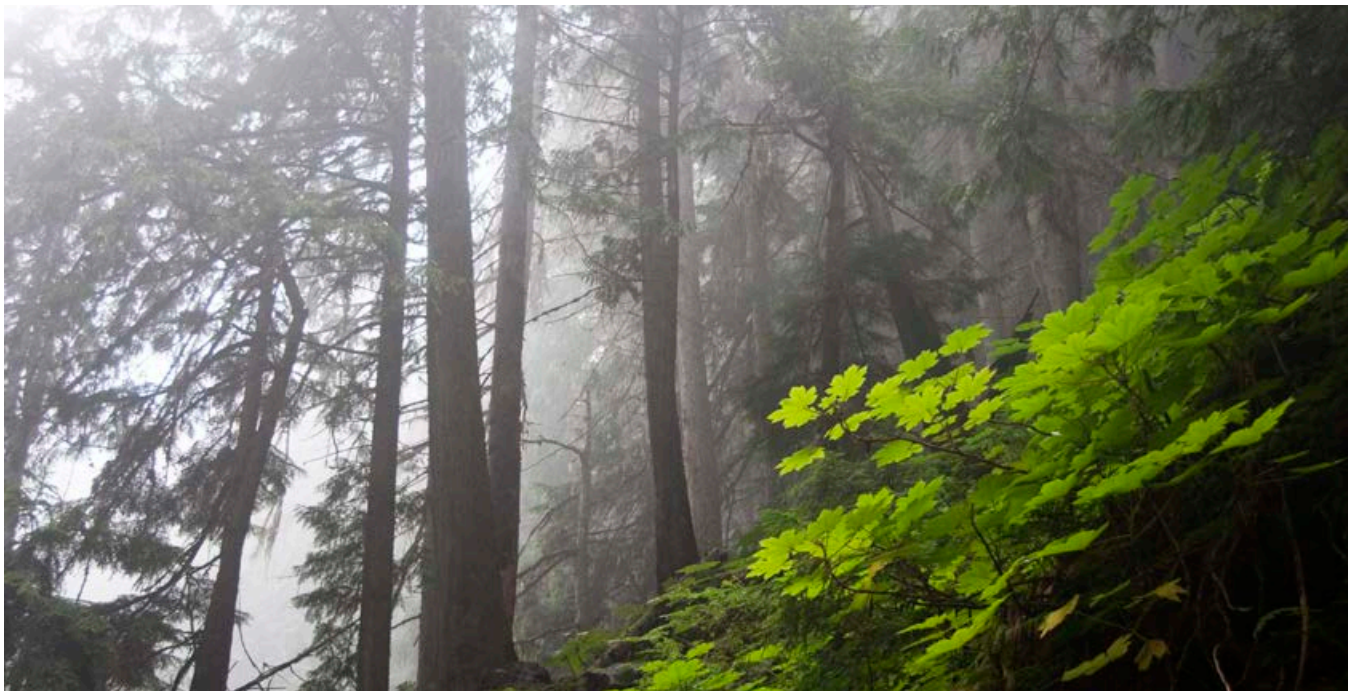
The Province will also protect jobs by ensuring B.C.'s global competitiveness. As our Climate Leadership Team recommended, we will design a mechanism to protect the competitiveness of our industries that depend on energy and trade.

> *British Columbia has the highest and most comprehensive carbon tax in North America.*

Carbon pricing is one of several key tools to tackle climate change. Technological breakthroughs and innovations are also required, as well as targeted actions to reduce greenhouse gas emissions, like the ones we are announcing today.

We are taking action across key areas where emissions are created, including upstream methane emissions mitigation, new transit options and energy-efficient building improvements. We are ensuring that we develop industries like liquefied natural gas in ways that are cleaner than competing jurisdictions, allowing us to ship it to other nations where it can reduce their reliance on higher carbon energy sources like coal and oil. By seizing the opportunity of a low carbon economy and securing global trade partnerships, we can create thousands of green jobs in areas like clean technology and clean energy, contributing to reductions in emissions not just here at home, but around the world.

Photo Credit: Adam Ryder/World Bank (https://creativecommons.org/licenses/by-nc-nd/2.0/legalcode)



B.C.'s Climate Leadership Plan must be a living, breathing strategy. It has to grow as we work with our partners across Canada to align policies to produce the most effective results. It must also engage our industry, communities and First Nations to find ways to achieve our goals together. This first set of actions cannot solve all of the issues we face — many will require complex strategies that account for a wide range of related factors. So we need to take the time to get them right.

B.C. is committed to reaching our 2050 target to reduce GHG emissions to 80 per cent below 2007 levels. That means continuing to update our plan, which we will do over the course of the following year and every five years after that.

This document will help you learn about the first new steps we are taking, as well as the ways that industry, First Nations, communities and individuals can participate in our mission to fight climate change.

The world is moving towards a lower carbon future and B.C. is well positioned to continue to lead this movement. With over 200 clean tech companies, abundant clean energy and natural resources, and a strategy to support innovation across all sectors, B.C.'s green economy is creating jobs today and the foundation for a secure tomorrow.

We applaud the federal government's renewed commitment to the fight against climate change, and look forward to working with them on the Pan-Canadian Framework. This is a critical issue that requires every level of government working together, alongside industry and communities, to create an integrated strategy to achieve our climate action goals. Our province is committed to being at the forefront of this fight and continuing to demonstrate climate action leadership.

We hope that you will join us in this important mission.

Sincerely,

HONOURABLE CHRISTY CLARK
PREMIER OF BRITISH COLUMBIA

Climate Leadership Plan at a Glance

The Climate Leadership Plan is British Columbia's next step to fight climate change. This plan highlights the first set of actions we are taking to help meet our 2050 emissions reduction target of 80 per cent below 2007 levels, while building a clean economy.

These actions are expected to reduce annual greenhouse gas emissions by up to 25 million tonnes below current forecasts by 2050 and create up to 66,000 jobs over the next ten years.

Natural Gas

Natural gas offers an opportunity to grow British Columbia's economy, while helping other jurisdictions reduce their carbon footprint by transitioning to this cleaner burning fuel.

We are taking action in three key areas:

- ☑ Launching a strategy to reduce upstream methane emissions by 45 per cent;
- ☑ Developing regulations to enable carbon capture and storage; and
- ☑ Investing in infrastructure to power natural gas projects with British Columbia's clean electricity.

This action area is expected to reduce annual emissions by up to 5 million tonnes by 2050.

Transportation

Transportation is essential to keep British Columbia moving, but a significant source of our emissions.

The Province is launching new actions to reduce the impact of transportation, including:

- ☑ Increasing the requirements for our Low Carbon Fuel Standard;
- ☑ Amending regulations that encourage switching commercial fleets to renewable natural gas;
- ☑ Expanding support for zero emission vehicle charging stations in buildings; and
- ☑ Expanding the Clean Energy Vehicle program to support new vehicle incentives and infrastructure.

This is in addition to our 10-year transportation plan that will:

- ☑ Invest in infrastructure to reduce congestion;
- ☑ Create new rapid transit lines; and
- ☑ Shift more public transit to low carbon fuels.

In total, this action area is expected to reduce annual emissions by up to 3 million tonnes by 2050.

Forestry & Agriculture

Forestry and agriculture are foundational industries in British Columbia's economy. Our forests also offer incredible potential for storing carbon, so we are taking further action to:

- ☑ Rehabilitate under-productive forests;
- ☑ Recover more wood fibre; and
- ☑ Avoid emissions from burning slash.

Additionally, we are expanding a nutrient management program that will help improve the environmental performance of B.C.'s farms. This action area is expected to reduce annual emissions by up to 12 million tonnes by 2050.

Industry & Utilities

B.C.'s industrial sectors create good jobs for British Columbians, but they also require significant amounts of energy to power production. That is why we are taking action to reduce these emissions, including:

- ☑ Developing new energy efficiency standards for gas fired boilers;
- ☑ Enabling further incentives to promote adoption of efficient gas equipment; and
- ☑ Facilitating projects that will help fuel marine vessels and commercial vehicles with cleaner burning natural gas.

We are working with utilities on their demand-side management programs to make electrification projects and natural gas equipment more efficient. We are also committing to making B.C.'s electricity 100 per cent clean or renewable, with allowances to address reliability. These actions are expected to reduce annual emissions by up to 2 million tonnes by 2050.

Communities & Built Environment

Communities across B.C. play a critical role in the fight against climate change, particularly in the areas of buildings, waste, and planning. To build on progress already made in our communities, we are:

- ☑ Working with local governments to refresh the Climate Action Charter;
- ☑ Identifying tools to focus growth near transit corridors; and
- ☑ Supporting more resilient infrastructure.

We are also amending regulations to promote more energy efficient buildings, developing requirements to encourage net zero ready buildings, and creating a strategy to reduce waste and turn it into valuable resources. This action area is expected to reduce annual emissions by up to 2 million tonnes by 2050.

Public Sector Leadership

B.C.'s public sector is already leading the way in demonstrating how climate action can help reduce emissions. To continue this leadership, we are taking action with new strategies, including:

- ☑ Promoting use of low carbon and renewable materials in public sector buildings; and
- ☑ Mandating the creation of 10-year emissions reduction and adaptation plans for provincial public sector operations.

This action area is expected to reduce annual emissions by up to 1 million tonnes by 2050.

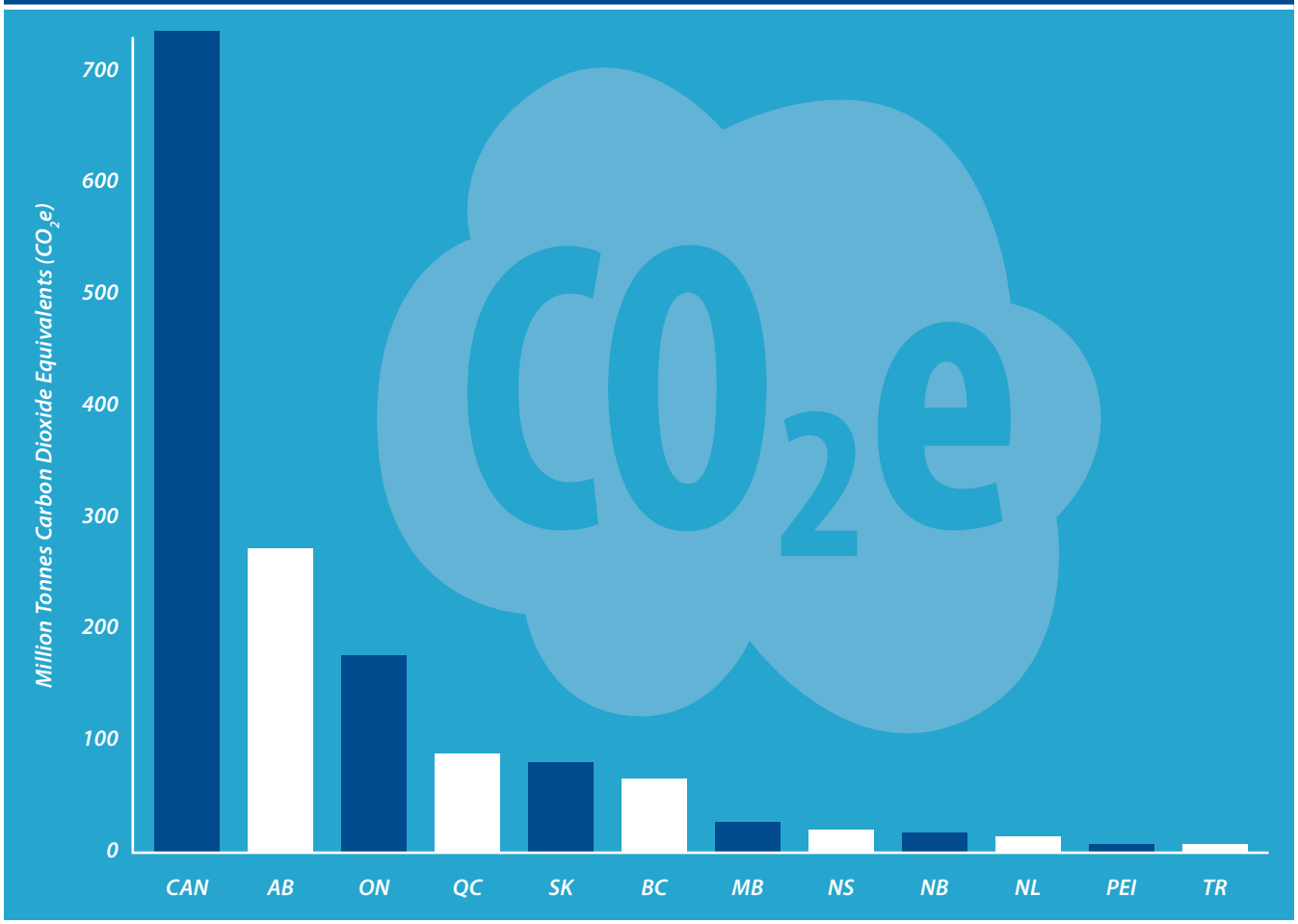
This set of 21 actions targets key areas we can act on now. The Climate Leadership Plan will be updated over the course of the following year as work on the Pan-Canadian Framework on climate action progresses.

Pathway to the Plan

The strategic actions included in this document represent the first steps the B.C. government is taking to update our climate action plan to work towards our 2050 goal. This plan is informed by the recommendations of our Climate Leadership Team, as well as our public engagement with British Columbians, industry, First Nations, communities and key stakeholders.

As we work with the federal government and our provincial and territorial partners to establish and implement a coordinated climate action plan, more actions will be announced. In this section you will learn what has driven the development of the actions being taken today, as well as a report on our progress to the 2050 target to date.

CANADIAN 2014 GREENHOUSE GAS EMISSIONS



Climate Change is Happening

Climate change is one of the most critical issues humanity faces. It is an important battle that all governments need to demonstrate leadership on.

This year in Canada, we saw its impacts happening in real time, as out-of-control wildfires in British Columbia and Alberta displaced thousands of workers, families and residents. The evidence is in front of us — we have already seen considerable climate change in British Columbia over the past century.

ENVIRONMENTAL CHANGE IN B.C. LOOKING BACK

TEMPERATURE: Average temperature has increased over all of B.C. since 1900 (1.4°C per century).*

PRECIPITATION: Average precipitation has increased over most of southern B.C. (1900 – 2013).

GLACIERS: All glaciers in British Columbia have retreated from 1985 to 2005.

SEA LEVEL RISE: Average sea level has risen along most of the B.C. coast over the past 95 years.

* *Winter is warmer on average than it was 100 years ago. Higher temperatures drive other climate systems and affect our environment and ecosystems.*

The impacts of climate change will become more pronounced as we head towards 2050. That is why it is critical we continue to work to achieve our climate action goals. We must take action to mitigate these impacts today.

LOOKING TO 2050

TEMPERATURE

- By 2050, B.C. is projected to be at least 1.3°C warmer and may be as much as 2.7°C warmer than in recent history.
- Growing seasons will be longer; species ranges will shift; the winter tourism season will be shorter.

PRECIPITATION

- By 2050, average annual rainfall may increase from 2 per cent to 12 per cent, with the potential for increased frequency of drier summers and increases in extreme rain events.
- Dry conditions contribute to forest fire season severity; heavy rain impacts buildings and infrastructure.

GLACIERS

- By 2100, B.C. is projected to lose up to 70 per cent of its glaciers.
- This will impact the timing and volume of river flow, drinking water quality and quantity, agriculture and winter alpine tourism.

SEA LEVEL RISE

- Sea level will continue to rise at most locations on the B.C. coast.
- Coastal flooding frequency and magnitude is expected to increase.

Sources: Plan2Adapt, Pacific Climate Impacts Consortium; http://www.plan2adapt.ca; Relative Sea-level Projections in Canada and the Adjacent Mainland United States; Geological Survey of Canada. James, TS, et al, 2014; and Projected Deglaciation of Western Canada in the 21st Century; Nature, Clarke et al, 2015.

British Columbia is Taking Action

Increasing knowledge of the impacts of climate change is what drove the launch of our world-leading Climate Action Plan in 2008. This plan included a wide range of large-scale policies designed to reduce British Columbia's impact on the environment, and was foundational in driving us to reach our first target to reduce GHG emissions to 6 per cent below 2007 levels by 2012.

To read the original plan in detail, go to: http://www2.gov.bc.ca/gov/content/environment/climate-change/policy-legislation-programs.

By the end of 2012, all of the actions outlined in the first plan were underway or complete, including more than $1 billion in climate action programs and tax incentives to encourage cleaner choices.

Since 2012, British Columbia has continued to invest in the innovation and infrastructure that will help us reach our 2050 target.

To date, an additional $1.9 billion has been dedicated to keeping British Columbia on the path to a lower carbon economy, including investments such as:

- » $50 million in clean energy and technology;
- » $831 million for clean transportation;
- » $300 million for transportation infrastructure;
- » $24 million to improve the energy efficiency of homes and businesses; and
- » $704 million for clean electricity infrastructure.

In 2016, British Columbia has continued engagement on climate action by participating in initiatives that align our climate action goals with our neighbours within Canada and internationally, including:

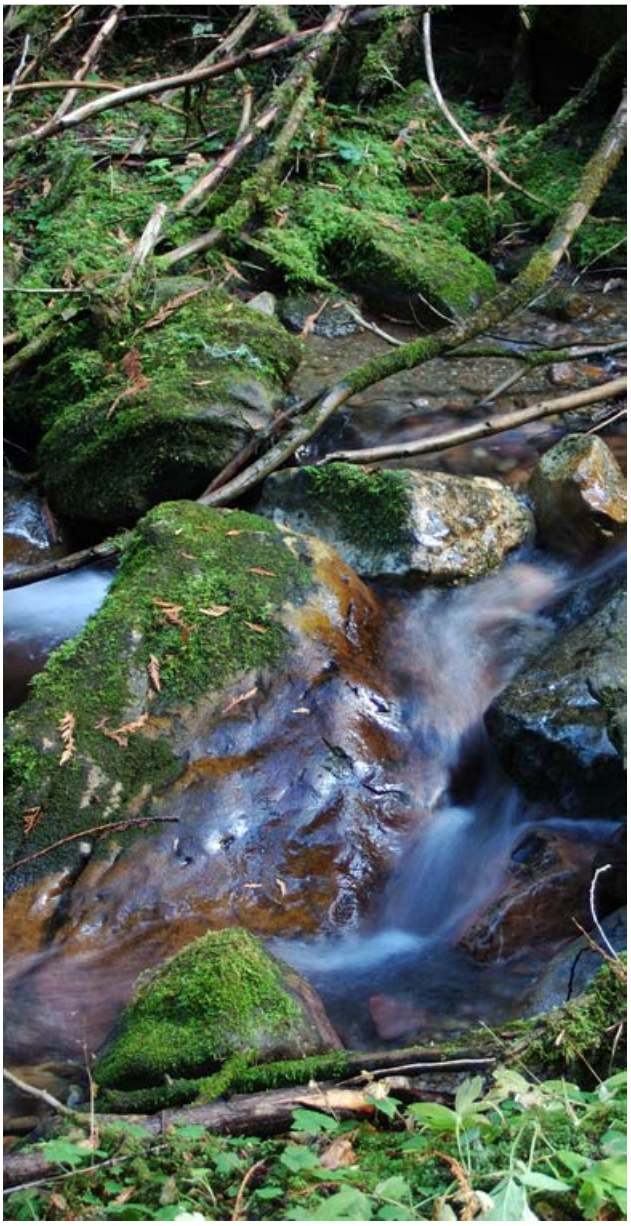
- The ***Vancouver Declaration on Clean Growth and Climate Change***;
- The ***Carbon Pricing Leadership Coalition***;
- ***Under 2 MOU*** (Subnational Global Climate Leadership Memorandum of Understanding);
- ***Pacific Coast Collaborative*** Climate Leadership Action Plan;
- ***RegionsAdapt*** Initiative; and
- ***International Zero-Emissions Vehicle Alliance***.

Now, the actions presented in this document outline the first steps we are taking under our new Climate Leadership Plan. This plan, which we will continue to update over the course of the following year and every five years after that, is creating strategies, programs, infrastructure, initiatives and incentives that will help us reach our 2050 target.

The Climate Leadership Team

In 2015, Premier Christy Clark challenged the world to meet or exceed the standard B.C. has set for climate action. She also announced that work was beginning to build on B.C.'s world-leading plan, including the formation of a Climate Leadership Team (CLT), made up of diverse leaders from British Columbia businesses, First Nations, local governments, communities, academia, and the environmental sector.

Through a series of collaborative working sessions, this team was asked to develop recommendations for actions that would maintain B.C.'s climate leadership. The CLT recommendations largely address carbon pricing and taking action to reduce emissions across the industry, transportation and built environmental sectors, while maintaining a strong economy.



The actions presented in this plan are driven by the hard work of the CLT. Throughout the action area descriptions, we have identified where they align with the CLT's recommendations. While they do not represent a full-scale implementation of all the CLT recommendations, we will continue to work on ways to take further action on their recommendations, particularly as our work with the federal government progresses and more funding opportunities for climate action become available.

To review the CLT's recommendations in detail, please visit: http://engage.gov.bc.ca/climateleadership/.

Public and Stakeholder Engagement

To inform the Province and the CLT's work, B.C. launched a public engagement campaign to invite input on the values and priorities British Columbians wanted to see in B.C.'s new climate action plan. We also conducted sector-specific engagements with stakeholders in B.C.'s various industries. Across two engagement periods we received considerable feedback, and affirmed the passionate commitment of British Columbians to fighting climate change.

Our engagement results to date include:

- 27,000+ website visits;
- 7,600+ feedback forms completed;
- 300+ detailed submissions;
- 7,400+ discussion guide downloads;
- 8,200+ emails received; and
- Input from over 300 organizations, local governments, and businesses via webinars, meetings, teleconferences, and email.

The initial survey presented four visionary goals for climate action, and asked British Columbians to prioritize which areas were most important to take action on, as well as priorities within each of those areas.

VISIONARY GOALS FOR CLIMATE ACTION

THE WAY WE LIVE:

- Focus: buildings, communities, and waste.
- Goal: communities are thriving and resilient in the face of climate change.

THE WAY WE TRAVEL:

- Focus: movement of people and goods.
- Goal: people and goods move efficiently and reliably, using clean transportation.

THE WAY WE WORK:

- Focus: business, industry, products and services.
- Goal: B.C.'s economy remains strong, and jobs continue to be created, while greenhouse gas emissions fall.

WHAT WE VALUE:

- Focus: how we consider the cost of climate change to society when making decisions.
- Goal: the cost of climate change to society is considered whenever British Columbians make important decisions.

Overall, the importance of a number of themes were repeated across the two engagement periods, particularly on issues such as transportation, clean technology and clean energy, the carbon tax, communities, climate adaptation and employment.

To see a summary of results from our consultations, go to: http://engage.gov.bc.ca/climateleadership/.

To achieve our goals, we need a shared vision that unites British Columbians in this important battle. That is why we listened to the priorities identified by British Columbians when developing this plan — fighting climate change must be a collaborative effort across government, industry, First Nations and communities.

The Province of British Columbia would like to thank all of the stakeholders that contributed to the development of this plan, from the Climate Leadership Team, to the individuals, communities, First Nations, businesses and organizations that participated in our public engagement campaigns.

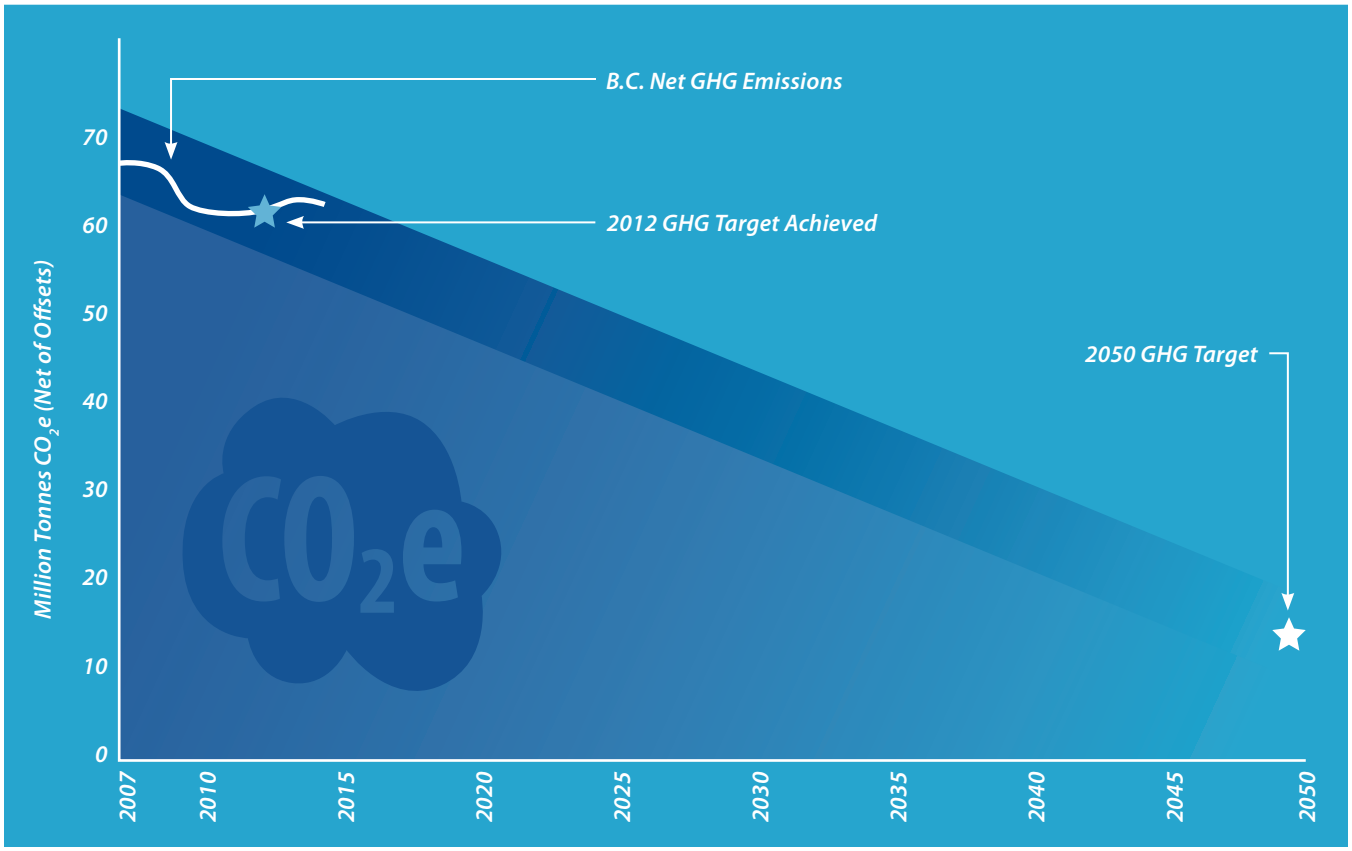
Fighting climate change is one of the most critical issues our world faces today, and any plan to combat it requires we listen to the voices of all those affected.

Progress to 2050 Target

Across all of this hard work and valuable contributions, one thing has clearly emerged — B.C. is committed to reaching our 2050 target of reducing GHG emissions to 80 per cent below 2007 levels. We have already made considerable strides towards that goal. In 2012, we reached our first interim target to reduce emissions to 6 per cent below 2007 levels.

Since that time, B.C.'s emissions levels have remained relatively unchanged. B.C.'s greenhouse gas emissions in 2014 were 62.7 million carbon dioxide equivalent tonnes (tCO_2e), including 1.8 million tonnes CO_2e in offsets from forest management projects, for a net reduction of 5.5 per cent since 2007. The 2014 greenhouse gas inventory for British Columbia can be viewed online at: http://www2.gov.bc.ca/gov/content/environment/climate-change/reports-data/provincial-ghg-inventory.

B.C. NET GHG EMISSIONS AND TARGETS



Without renewed action, emissions may begin to rise again. So we are taking action starting with the release of this plan.

Beyond overall GHG emissions reductions, further proof that our plan is working is evidenced in the way that carbon pollution is decoupling from Gross Domestic Product (GDP) growth. In their recommendations, the CLT noted that:

> *"This past year, global carbon pollution from fossil fuels levelled off, even as GDP continued to grow. It was the first time in nearly half a century that carbon pollution decoupled from GDP globally. The International Energy Agency, which reported the finding, cited policy action on energy efficiency and renewable energy as the main factor driving the change.*
>
> *It was a remarkable signal and — as the impacts of climate change become increasingly visible and acute — it telegraphed a clear message to governments: Your efforts are essential, and you are making a difference. Keep going."*

In B.C., both GDP and population have been growing at rates comparable to the national average. Between 2007 and 2014, population growth in B.C. has been 8.1 per cent. Real GDP growth has been 12.4 per cent. With relatively stable emissions, this demonstrates a reduction in GHG intensities, both per capita and per dollar of economic output.

This decoupling shows that British Columbia has the ability to continue growing our economy and creating jobs, without a proportional increase in GHG emissions. However, we must be cautious in our approach, and each policy we implement must be tested before it is put into place to ensure that it is both environmentally and economically sustainable.

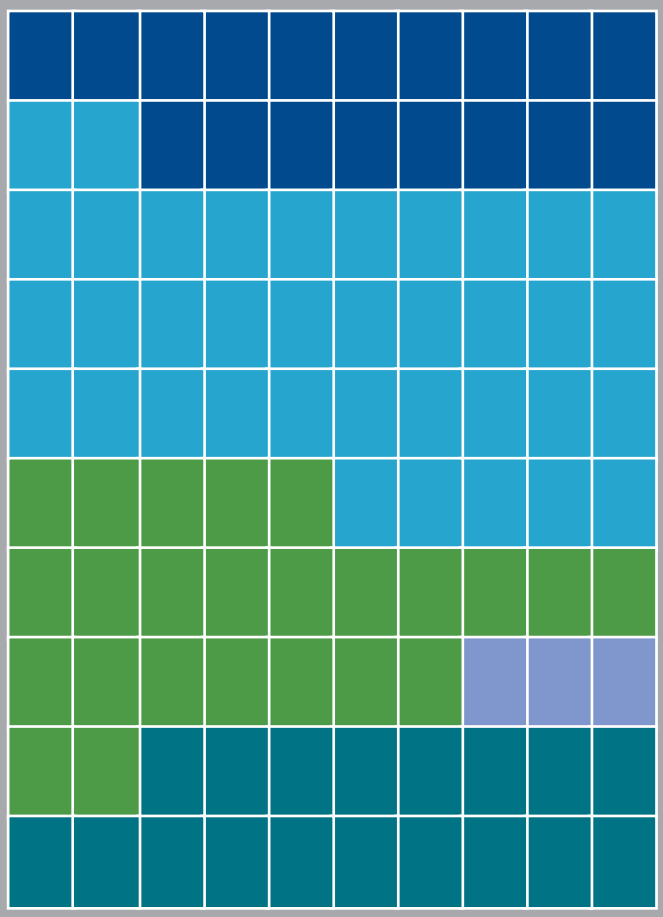
B.C.'s emissions per capita and per unit of GDP are well below the national average. Going forward, the rate of this decoupling needs to accelerate to hit our target. However, this information sends a clear message — our plan is working.

Action Areas

In the following sections of British Columbia's Climate Leadership Plan, we have identified the key areas where we can take action today: natural gas; transportation; forestry and agriculture; industry and utilities; communities and built environment; and public sector leadership.

While further actions will be announced over the course of the following year, these areas represent critical priorities where B.C. can take action to reduce GHG emissions that are not dependent on the work we are undertaking with the federal government on a Pan-Canadian Framework to fight climate change.

2014 GHG EMISSIONS BY SECTOR



INDUSTRY & UTILITIES 18%
- Electricity 1%
- Cement 3%
- Mining and smelting 3%
- Forest products 3%
- Manufacturing 8%

TRANSPORTATION 37%
- Commercial transport 23%
- Personal transport 14%

BUILT ENVIRONMENT 24%
- Residential buildings 6%
- Commercial buildings 4%
- Waste 9%
- Deforestation 5%

AGRICULTURE 3%

OIL & GAS 18%

Note: In 2014, British Columbia's emissions were 62.7 million tonnes CO_2e, including 1.8 million tonnes CO_2e in offsets from forest management projects.

Action Area: Natural Gas

WHY NATURAL GAS MATTERS

Natural gas is a growing industry in B.C. that can secure our economy for generations to come, while creating good jobs for our citizens. Natural gas is also the cleanest burning fossil fuel, representing an opportunity to shift global economies off GHG-intensive fuels like coal and oil to reduce worldwide emissions. The sector is reducing emissions intensity as it grows and currently contributes about 18 per cent of B.C.'s total emissions.

B.C.'s climate action strategy and implementation of new technology by the natural gas industry has already contributed to a 37 per cent decrease in emission intensity per unit of production since 2000. We have also eliminated all routine flaring at oil and gas wells and production facilities. Our carbon tax, together with offset payments, has encouraged improved efficiency in the sector, including waste heat recovery, methane leak reduction and electrification of facilities.

Yet we must still do more. B.C.'s natural gas sector needs to meet the challenge of becoming one of the world's cleanest producers and distributors of this fuel, so that the benefits of this cleaner burning fuel can contribute to global GHG reductions when we ship it to markets seeking to transition away from more emissions intensive fuels.

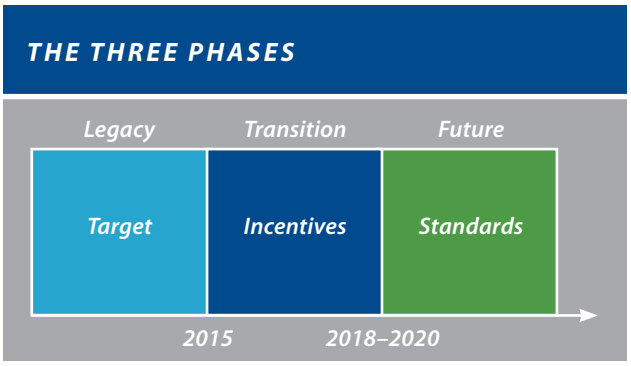
Almost 40 per cent of the natural gas sector's emissions come from non-combustion sources such as venting and leaks. Establishing standards for these processes that will lead in North America will help the sector to curb emissions as operations continue.

TAKING ACTION: LAUNCHING A STRATEGY TO REDUCE METHANE EMISSIONS

Oil and gas production accounts for approximately 11 million tonnes of annual GHG emissions in our province. Approximately 2.2 million tonnes of that total come from fugitive and vented methane emissions released during the production process.

As such, the CLT recommended that B.C. should set a goal to reduce fugitive and vented methane emissions by 40 per cent within five years, through regulating best practice leak detection and repair activities, as well as developing methane reduction and reporting best practices. They also recommended that after five years we determine if a more ambitious action is necessary.

Our first action for the natural gas sector is a methane emissions reduction strategy. This strategy is targeted at producing real, tangible reductions in emissions, while ensuring the industry remains competitive and has room to grow. B.C. will tackle methane emissions in three phases, using a combination of tools.



» The legacy phase will include targets for reducing fugitive and vented emissions from extraction and processing infrastructure built before January 1st, 2015. This will include:

- A 45 per cent reduction of these emissions by 2025, estimated at an annual reduction of 1 million tonnes for 2025; and
- A midpoint check in fall 2020 to determine progress towards this target, establish what happens if the target is not attained by 2025, and make adjustments if the target is not technically feasible.

» The transition phase will offer incentives to drive methane emissions reductions for all applications built between 2015 and 2018, and to help tackle legacy infrastructure retrofitting. Incentives will include:

- A Clean Infrastructure Royalty Credit Program, which will help stimulate investments in new technology to convert current infrastructure to less carbon intensive machinery. The pilot program will provide royalty deductions of up to 50 per cent of the cost of developing infrastructure that reduces fugitive or vented methane emissions from oil and gas; and
- A new offset protocol to further encourage innovative projects that reduce methane emissions.

» The future phase will establish standards that will guide the development of projects after the transition phase. This will include:

- Developing and enforcing standards to reduce methane emissions for all applications; and
- Making leak detection and repair mandatory, with protocols to be developed and enforced in alignment with other jurisdictions.

» Coordination with western Canadian provinces and the federal government will also be a key part of our methane emissions reduction strategy, to ensure regulatory alignment, while allowing for flexible provincial approaches accounting for resource base and individual provincial needs.

GET INVOLVED: SWITCH YOUR TRUCK FLEET TO NATURAL GAS

Cleaner burning natural gas can help you reduce the environmental impact of your industrial truck fleet.

FortisBC will cover up to 90 per cent of the cost to convert your medium/heavy duty fleet to compressed natural gas or liquefied natural gas.

Check out the full range of transportation fuel incentives available: https://www.fortisbc.com/NaturalGas/Business/NaturalGasVehicles/Howwecanhelp/Incentives/Pages/default.aspx.

MORE EFFICIENT ENGINES MEAN FEWER EMISSIONS

REM Technology Inc. is helping the natural gas industry lower its emissions through the use of two innovative new technologies called REMVue® AFR and SlipStream®. The REMVue® AFR is an engine management system used to control natural gas engines that compress natural gas from well-sites to processing plants. The system enables these engines to run more efficiently and reliably, while lowering the emissions created in the process. SlipStream® is designed to capture vented hydrocarbons like methane, and utilize them as fuel, either for a natural gas engine or process burner. Not only does this technology significantly reduce greenhouse gases, it reduces fuel costs for the engine or burner by up to 50 per cent. B.C.'s provincial offset standards and carbon pricing are helping drive these innovative offset projects.

TAKING ACTION: REGULATING CARBON CAPTURE AND STORAGE PROJECTS

Another important area where we have taken action to reduce the impact of natural gas development on climate change is Carbon Capture and Storage (CCS). CCS involves using innovative technology to capture waste carbon dioxide from industrial facilities and then transport it to a storage site, such as an underground geological formation, so it will not enter the atmosphere.

The Ministry of Natural Gas Development has developed a CCS regulatory policy framework to guide CCS development, ensure it is done safely, and provide transparency. In fall 2015, the first piece of legislation needed to enable CCS was passed. The Province is now collaborating with the BC Oil and Gas Commission to complete the regulatory policy framework and develop the additional legislative changes needed to allow CCS projects to proceed.

TAKING ACTION: USING ELECTRICITY TO POWER NATURAL GAS PRODUCTION AND PROCESSING

B.C.'s planned liquefied natural gas projects will create thousands of jobs and require additional volumes of natural gas production. The Province is committed to capitalizing on this opportunity while minimizing its carbon footprint. Production and processing (referred to as the "upstream" natural gas sector) typically requires the use of natural gas and diesel as fuel for industrial processes. Replacing those fuels with B.C.'s clean electricity could contribute to significant GHG reductions.

Capital funding will be necessary to develop upstream electrification of several key projects:

- Peace Region Electricity Supply Project;
- North Montney Power Supply Project; and
- Other upstream electrification infrastructure.

Electrification of natural gas developments in the Montney formation in Northeast B.C. is currently proceeding with existing infrastructure to avoid GHG emissions by up to an estimated 1.6 million tonnes per year. Full electrification of the Montney Basin could avoid up to 4 million tonnes of emissions per year, minimizing the GHG footprint of upstream natural gas development to ensure that B.C. has the cleanest LNG in the world.

Broader electrification of the Montney formation will require considerable capital investments in electricity transmission from both the federal government and B.C. It will also require the design of programs to make electricity costs comparable to natural gas costs for upstream applications. To support this action, the B.C. government is in dialogue with the federal government to provide the necessary capital to develop the required infrastructure. Programs are also being developed to close the gap between electricity and natural gas costs. Construction of this infrastructure would begin once LNG companies make their final investment decisions.

Action Area: Transportation

WHY TRANSPORTATION MATTERS

Transportation is essential to our economy and way of life. It also accounts for 37 per cent of B.C.'s total emissions, making it a key area where climate action can make a significant impact.

Climate action in the transportation sector must focus on supporting interconnected communities and the efficient movement of goods and people. That means: encouraging adoption of efficient vehicles and creating associated cost savings; supporting innovation in clean vehicles and fuels that improve our air quality, while creating new jobs in the clean tech industry; and working to guide the development of safe and reliable transportation infrastructure that is built to withstand extreme weather events.

We have already made significant progress in this action area. Our low carbon fuel requirement is driving innovation and growing the diversity of commercially available low carbon fuels, leading to the avoidance of over 2.3 million tonnes of GHG emissions between 2010–2012.

B.C.'s 10-year transportation plan includes a commitment to one third of the funding for new rapid transit projects and expanding compressed natural gas fleets. Building on the success of the 2009 rapid transit Canada Line, the new Evergreen rapid transit line will link the communities of Burnaby, Port Moody and Coquitlam with Vancouver, increasing transit integration and capacity in Metro Vancouver.

We have also invested in an incentive program for clean energy vehicles, supported by aggressive charging infrastructure installations, which has led to the purchase of 2,700 electric and hydrogen fuel cell vehicles and the development of over 1,100 charging stations in the province. We now lead the country in clean energy vehicle sales per capita.

As our economy grows, so will our transportation needs. It is imperative that we maximize the efficiency of the entire goods movement chain, to lower our impact on the environment and ensure the competitiveness of our economy.

We also need to provide more transit alternatives to British Columbians, to reduce the overall rate of vehicle kilometres travelled per capita.

REDUCING DIESEL USE IN NANAIMO

Public transit helps people get where they need to go, while lowering the number of emission-producing vehicles on the road.

The Regional District of Nanaimo (RDN) is taking this a step further by committing to switching its remaining diesel-powered buses to buses powered by compressed natural gas (CNG) by 2017.

This switch will cut greenhouse gasses and make the RDN Transit the first conventional fleet in Canada to be completely CNG powered. The co-benefits of CNG buses include lower fuel costs and quieter engines.

Photo Credit: BC Transit

TAKING ACTION: INCREASING THE LOW CARBON FUEL STANDARD

British Columbia's Low Carbon Fuel Standard is reducing the carbon intensity of transportation fuels by 10 per cent by 2020, relative to 2010.

The Climate Leadership Team recommended that we increase this requirement in the future to continue to drive greenhouse gas reductions.

We are now taking action to increase British Columbia's Low Carbon Fuel Standard to 15 per cent by 2030. This action is expected to achieve up to a 3.4 million tonne reduction in annual greenhouse gas emissions.

TAKING ACTION: INCENTIVES FOR USING RENEWABLE NATURAL GAS

Natural gas is considered renewable when it is produced from sources of biogas such as organic waste or wastewater. B.C. will be amending the Greenhouse Gas Reduction Regulation to encourage emission reductions in transportation. This amendment will allow utilities to double the total pool of incentives available to convert commercial fleets to natural gas, when the new incentives go towards vehicles using 100 per cent renewable natural gas. The program will also:

- Promote investments in natural gas fuelling stations at customers' facilities; and
- Support the production of renewable natural gas resources through increased demand.

MOVING PEOPLE WITH TRANSIT

Transit is the backbone of a low carbon community and an integral part of a healthy built environment. That is why the Province is working to improve public transportation infrastructure in Metro Vancouver and in BC Transit communities across the province. This will include the purchase of more SkyTrain cars, improvements to bus exchanges and SkyTrain stations, enhanced SeaBus service, initial work towards new major rapid transit in Vancouver and Surrey, and the modernization of a variety of TransLink's transit infrastructure. Outside of the Lower Mainland, the Province will build new maintenance yards and bus depots, and purchase new, cleaner and more efficient buses. Combined with contributions from federal and local governments, these improvements will benefit residents across the province opening up more affordable, transit-friendly communities.

TAKING ACTION: INCENTIVES FOR PURCHASING A CLEAN ENERGY VEHICLE

B.C.'s Clean Energy Vehicle program is designed to encourage the use of zero emission vehicles (ZEVs) throughout the province. Residents, businesses, organizations and local governments that purchase or lease qualifying new ZEVs are eligible for incentives off the pre-tax sticker price for battery electric, fuel cell electric, plug-in hybrid electric, and hydrogen fuel cell vehicles. These incentives can be combined with B.C.'s SCRAP-IT program to get older, higher emission vehicles off the road.

The Clean Energy Vehicle program is being expanded to support new vehicle incentives and infrastructure, as well as education and economic development initiatives.

GET INVOLVED: BUY A CLEAN ENERGY VEHICLE

Thinking of buying a clean energy vehicle? Learn about point-of-sale incentives that are available to help you purchase one through the Clean Energy Vehicle Program: www.gov.bc.ca/cleanenergyvehicleprogram.

Also, if you have an old gas guzzler that needs to be scrapped, see how we can help at: scrapit.ca.

If you're purchasing a clean energy vehicle and scrapping a gas guzzler, you could be eligible for both incentive programs.

TAKING ACTION: SUPPORTING VEHICLE CHARGING DEVELOPMENT FOR ZERO EMISSION VEHICLES

Since vehicles represent such a significant portion of our emissions profile, policies that facilitate the adoption of zero emission vehicles like electric cars can make a significant impact in the fight against climate change. A major challenge for adoption of these vehicles is ensuring that owners can access charging stations.

That is why we are taking action to support the development of charging stations across the province. These actions include:

- Developing regulations to allow local governments to require new buildings to install adequate infrastructure for electric vehicle charging; and
- Developing policies to facilitate installing electric vehicle charging stations in strata buildings and developments.

TAKING ACTION: 10-YEAR PLAN TO IMPROVE B.C.'S TRANSPORTATION NETWORK

B.C. on the Move is our 10-year plan to improve the province's transportation network that is already underway. It includes a comprehensive set of strategies that were driven by engagement of the public and key stakeholders, including actions that will help drive GHG reductions in a number of areas.

» Transitioning to low carbon fuels:

- Increasing the number of B.C. Transit compressed natural gas (CNG) buses and fuelling stations; and
- BC Ferries is investing in 3 new vessels and conversion of 2 large vessels to dual fuel capable ferries that can run on either liquefied natural gas or ultra-low sulphur diesel.

» Expanding transit:

- Supporting the construction of new rapid transit in Vancouver; and
- Developing rapid transit in Surrey.

» Reducing congestion:

- Replacing the George Massey Tunnel to reduce idling; and
- Optimizing movement through Canada's Pacific Gateway.

To review the entire B.C. on the Move plan, visit: https://engage.gov.bc.ca/transportationplan/.

GET INVOLVED: RIDE THE HOV LANE AND FIND A CHARGING STATION

Did you know B.C. allows approved electric vehicles to use high occupancy vehicle (HOV) lanes? Getting around in your electric vehicle has never been easier — especially with an ever growing network of charging stations. To find a station, go to: http://pluginbc.ca/charging-stations/finding-stations/.

CLEANING UP WASTE COLLECTION IN SURREY

In 2012, the City of Surrey mandated that its waste collection services be carried out using compressed natural gas vehicles. As a result, the city's contractor, Progressive Waste Solutions (PWS), launched a state-of-the-art CNG fleet for waste collection in Surrey, helping reduce emissions while diverting waste from landfills. These trucks emit 23 per cent less carbon emissions and 90 per cent less air particulates compared to diesel trucks. The city is also developing the first fully integrated organic waste biogas processing facility in North America that will be completed in 2017. The facility will turn organic waste collected at curbside into biogas and nutrient rich compost. The biogas will in turn be used to fuel the waste collection fleet, while the compost will be used by local farmers to produce fruits and vegetables. It is another step Surrey is taking to close the loop and become a zero-waste city.

Action Area: Forestry and Agriculture

WHY FORESTRY AND AGRICULTURE MATTER

Forestry and agriculture are foundational sectors of the B.C. economy, and areas that offer significant opportunities to take action against climate change.

Agriculture accounts for about three per cent of our emissions, arising from manure management, agricultural soils, and the methane produced when animals such as cattle and sheep digest food.

Greenhouse gas emissions from vehicles and mills used in forestry are counted as a component in the transportation and industrial sectors. The level of carbon stored in British Columbia's forests fluctuates from year to year based on natural factors such as fires, pests or weather.

In 2014, forestry offset projects alone removed 1.8 million tonnes of CO_2 from the atmosphere, creating jobs and unlocking new revenue streams for First Nations, communities, forest companies and private owners.

In the agriculture sector, changes in fertilizer use and soil management hold the promise of reducing greenhouse gas emissions. Many greenhouse growers are taking innovative steps to reduce their use of fossil fuels by incorporating clean tech solutions such as biomass boilers, thermal curtains and heat storage systems. Provincial offset standards and carbon pricing are making these changes more economically viable, driving their adoption in the sector.

Furthermore, many farmers in B.C. are also reducing emissions while creating new business opportunities by maximizing the value of agricultural byproducts, turning their waste into valuable resources and demonstrating the way one of our oldest industries is adapting to climate change.

PRINCE GEORGE'S WOOD INNOVATION AND DESIGN CENTRE

The award-winning Wood Innovation and Design Centre in Prince George was designed to demonstrate the way that innovative forms of wood production and use can lead to a more sustainable and beautiful future.

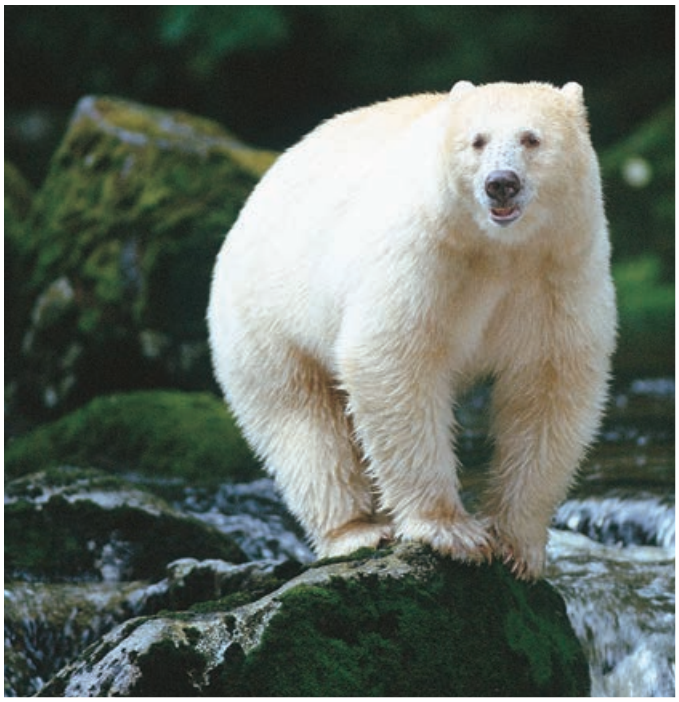
It makes use of mass timber, a wood product made from laminating together many smaller pieces of spruce, pine or fir. This centre showcases how British Columbia forest products can be made to order with powerful structural properties, while having a much smaller carbon footprint than steel or concrete.

Most recently, it was awarded the Governor General's Medal in Architecture in 2016 for its use of innovative and sustainable building technologies, the highest honour that can be given to an architectural project in Canada.

PROTECTING THE GREAT BEAR RAINFOREST TO REMOVE GREENHOUSE GASSES

The Great Bear Rainforest is one of British Columbia's most spectacular natural wonders — and an effective means of removing significant GHG emissions from the atmosphere. Great Bear's North and Central Mid-Coast, South Central Coast and Haida Gwaii forest carbon projects use ecosystem-based management practices that protect areas of the forest that were previously slated for logging.

These projects were enabled through the British Columbia Forest Carbon Offset Protocol and atmospheric benefit sharing agreements, developed in collaboration with First Nations leaders. In addition to reducing emissions, they also support the area's biodiversity and cultural heritage, while creating local economic opportunities.



TAKING ACTION: ENHANCING THE CARBON STORAGE POTENTIAL OF B.C.'S FORESTS

B.C.'s forest ecosystem covers more than 54 million hectares and provides us with significant potential for climate change mitigation.

We can harness this opportunity to sequester atmospheric carbon dioxide in this tremendous public asset through intensive forest management practices and storing carbon in long-lived wood products. That is why the Climate Leadership Team recommended that we update current forest policy and regulation to increase carbon sequestration.

So we are taking action to do even more to harness the incredible power of our forests through the new Forest Carbon Initiative, which will:

» Enhance the carbon storage potential of British Columbia's public forests; and

» Increase the rate of replanting and fiber recovery by 20,000 hectares per year.

This initiative will focus on enhancing the carbon sequestration of Mountain Pine Beetle and wildfire impacted sites — capturing the carbon benefits of new reforestation, while avoiding emissions from burning slash. This work will build on existing forest management programs, such as the recently announced Forest Enhancement Society and Forest for Tomorrow.

The Forest Carbon Initiative will rehabilitate up to 300,000 hectares of impacted sites over the first five years of the program. By 2050, the ten-year program is expected to lead to an annual reduction in greenhouse gas emissions of up to 11.7 million tonnes.

IMPROVED WOOD FIBRE USE

B.C.'s Fibre Action Plan is helping to generate more value and less greenhouse gas emissions from the province's forest resources. Through a pilot project with primary harvesters and Zellstoff Celgar Pulp Mill in Castlegar, approximately 500,000 cubic metres of residual wood (the equivalent of over 12,000 loaded logging trucks) that would once have been left in the forest were utilized as a source of fibre for the mill over the past three years. This not only helped to decrease the risk of wildfire, it saved approximately 185,000 tonnes of CO_2e from reduced slash pile burning. Additionally, the project created new jobs and economic benefits for the forest sector.

THE CHEAKAMUS COMMUNITY FOREST

The Cheakamus Community Forest carbon offset project is located adjacent to the Resort Municipality of Whistler, within the traditional territories of the Squamish and Lil'wat Nations.

The project retains more carbon in the forest by using ecosystem-based management practices that include increasing protected areas and using lower-impact harvesting techniques. Revenues from this B.C. offset project help overcome barriers to balancing environmental and economic sustainability, boosting additional uses for the forest such as recreation, tourism, and habitat protection.

Photo Credits: Bob Brett

TAKING ACTION: DEVELOPING A NUTRIENT MANAGEMENT PROGRAM TO REDUCE EMISSIONS

In the agriculture sector, a nutrient management program is being developed to demonstrate best practices to reduce fertilizer use and GHG emissions, and is expected to lead to a nearly 100,000 tonne reduction of annual GHG emissions. This Nutrient Management Program will include:

- Expanding trials to develop and demonstrate nutrient management best practices to the agriculture industry;
- Increasing funding to the sector to implement Beneficial Management Practices that will promote better nutrient management and further reductions in GHG emissions; and
- Scaling up monitoring of nutrient management benefits and developing longer term performance indicators to measure their success.

GET INVOLVED: ADAPT YOUR FARM FOR CLIMATE CHANGE

The Farm Adaptation Innovator Program supports projects that help build capacity for British Columbia farmers to adapt to climate change. Learn more about this and other resources to enhance agriculture's ability to adapt to climate change: www.bcagclimateaction.ca/farm-level/adaptation-innovator-program/.

GET INVOLVED: BECOME A MORE SUSTAINABLE FARM

Farming sustainably is good for the planet and good for business. The Environmental Farm Plan Program supports farm operations to complete agri-environmental risk assessments. After completing an Environmental Farm Plan, farmers can apply for funding to implement Beneficial Management Practices that help to increase agricultural and environmental sustainability. Learn more at: https://www.bcac.bc.ca/ardcorp/program/environmental-farm-plan-program.

CREATING RENEWABLE NATURAL GAS FROM MANURE AND ORGANIC WASTE

Expanding agricultural production in the Lower Mainland requires solutions to the issue of manure produced by the large numbers of dairy cattle. With support from the Ministry of Agriculture's innovation program, Seabreeze Farms in Delta has built an anaerobic digester that is turning manure and other organic waste into biogas, digestate (organic fertilizer) and bedding for cows.

The biogas is created by capturing methane that would otherwise have gone into the atmosphere. The biogas is cleaned and upgraded into renewable natural gas that displaces conventional natural gas with a renewable energy source.

Photo Credit: Delta Farmers Institute

Action Area: Industry and Utilities

WHY INDUSTRY AND UTILITIES MATTER

B.C. industry creates thousands of good jobs, but requires significant amounts of energy to drive their production systems. These large-scale users of energy represent almost 18 per cent of our total emissions.

We are already driving innovation in this area with our carbon tax, which covers approximately 60 per cent of the emissions in this sector. As the world shifts to a low-carbon economy, B.C.'s low-carbon electricity has become a competitive advantage for B.C.'s businesses, driving industry to create green jobs and products that are helping the world reduce GHG emissions.

The portion of BC Hydro's power generation portfolio that comes from clean or renewable resources is currently 98 per cent, already above the 93 per cent requirement in B.C.'s Clean Energy Act. Furthermore, B.C.'s abundant supply of clean burning natural gas represents enormous potential to shift our industrial sectors and global partners off the use of more GHG intensive fuels, particularly in areas such as fuelling marine transportation vessels.

British Columbia has also established the Innovative Clean Energy Fund, through which we have invested over $70 million to support the development of clean energy and energy efficiency technologies in the electricity, alternative energy, transportation and oil and gas sectors.

TAKING ACTION: MAKING B.C.'S ELECTRICITY 100% RENEWABLE OR CLEAN

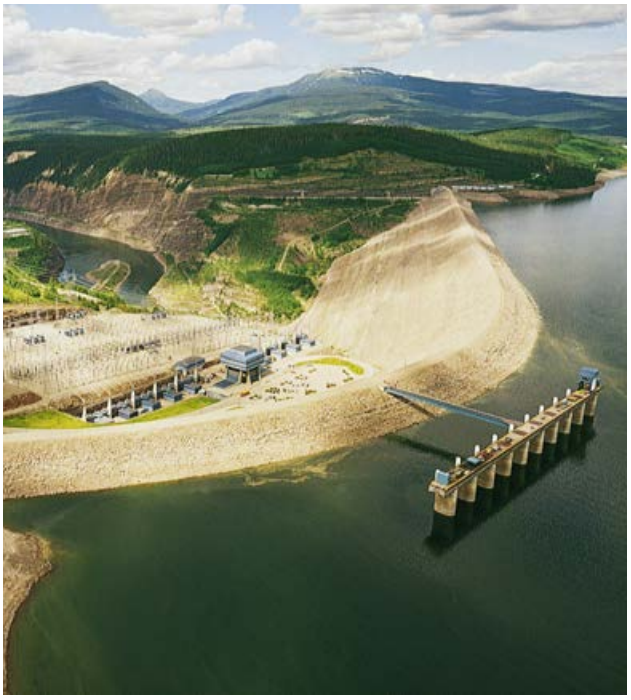
B.C.'s clean electricity supply is activating numerous opportunities to reduce GHG emissions across our industrial sectors. When an industry switches to electricity instead of fossil fuels, their emissions go down. The CLT recommended that we increase the target to 100 per cent clean energy on the integrated grid by 2025, while allowing for the use of fossil fuels for reliability. BC Hydro will focus on acquiring firm electricity from clean sources.

Going forward, 100 per cent of the supply of electricity acquired by BC Hydro in British Columbia for the integrated grid must be from clean or renewable sources, except where concerns regarding reliability or costs must be addressed. Acquisition of electricity from any source in British Columbia that is not clean or renewable must be approved by government through an Integrated Resource Plan, where it will be aligned with the specific reliability or cost concerns.

TAKING ACTION: EFFICIENT ELECTRIFICATION

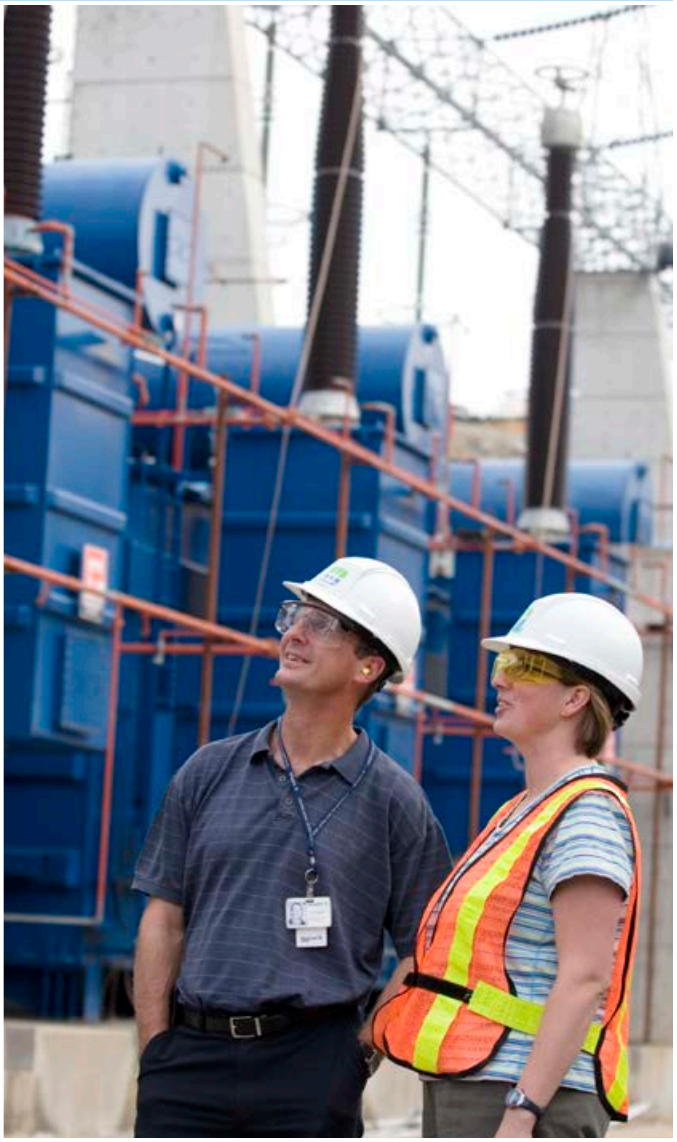
Demand-side management (DSM) programs help customers reduce energy bills by fostering awareness of energy use and providing incentives to increase energy efficiency. These programs can take on an expanded role in climate leadership, helping customers to understand their GHG emissions and providing incentives for efficient electric technologies to reduce GHG emissions.

To advance efficient electrification, we are taking action by working with BC Hydro to expand the mandate of its DSM programs to include investments that increase efficiency and reduce GHG emissions.



RENEWABLE ENERGY IS CREATING GREEN JOBS

British Columbia's clean energy producers have reported investment of more than $6 billion in First Nations communities and local economies, while fighting climate change and creating thousands of jobs throughout the north and interior regions. This growing sector has to date supported 15,970 direct, full-time equivalent (FTE) person years of construction employment in every region of the province, with another 4,543 FTE person years of employment projected for forthcoming projects. Furthermore, renewable power companies now employ 641 people in operational roles around the province, and new projects now under construction will support an additional 165 positions once completed. About 25 per cent of BC Hydro's energy supply now comes from independent power producers. The Province is also working with our neighbours in Alberta to investigate the opportunity for greater integration of our power systems, which would allow British Columbia to deliver more clean electricity to Alberta to reduce their reliance on fossil fuels to power industrial processes, thereby reducing their climate impact. British Columbia is truly demonstrating the business opportunity of renewable energy, while lowering our impact on the environment in the process.



SOLAR-POWERED T'SOU-KE

In 2013, T'Sou-ke Nation became the first Aboriginal community in the world to be designated a solar community. They have installed three solar demonstration projects. One demonstrates how remote 'off grid' communities can economically switch from diesel to solar. Another demonstrates how to be 'Net Zero' — which means no more electricity bills. Solar panels on their reservation are used to power all the administrative buildings, while sending their excess solar power back to the grid to contribute to British Columbia's clean energy profile. On sunny days, that excess can be up to 90 per cent of the power produced.

The profits of selling this power back to B.C. Hydro offsets their power bills during darker months. The project received $400,000 in funding from the Province's Innovative Clean Energy Fund. Solar programs in Colwood, the Capital Regional District and several First Nations throughout B.C. have been modelled after T'Sou-ke's leadership. T'Sou-ke is now working on harnessing the energy of the wind and waves to create more clean energy for their community and the province. T'Sou-ke Eco Tourism has been boosted by this project, with over 2,000 people from all over the world visiting each year for solar tours and workshops.

TAKING ACTION: FUELLING MARINE VESSELS WITH CLEANER BURNING LNG

B.C.'s abundant supply of natural gas represents a significant opportunity for industry to lower their impact on the environment. For example, B.C. can help the world replace high-emission marine transport fuels with cleaner burning natural gas, leading to global reductions in GHG emissions.

The Greenhouse Gas Reduction Regulation allows utilities to invest in clean transportation and infrastructure to reduce GHG emissions by replacing the use of higher emitting diesel with natural gas in a variety of sectors.

In particular, FortisBC has been expanding the use of compressed natural gas (CNG) and liquefied natural gas (LNG) in the heavy duty transportation sector since 2012, under its Natural Gas for Transportation initiative. Since 2012, FortisBC has committed $48 million in incentive funding towards the purchase of CNG and LNG vehicles.

These incentives translate to 485 CNG vehicles, 138 LNG vehicles, 6 mine haul trucks and 7 marine vessels that are in operation currently or will be in operation soon. These efforts will result in the reduction of over 74,000 tonnes of GHG emissions annually.

Recent amendments to the regulation will allow utilities to provide further incentives for the marine, mining and remote industrial power generation sectors. It is expected that by 2022 there will be an additional reduction of at least 300,000 tonnes of annual GHG emissions.

GET INVOLVED: MINIMIZE YOUR CARBON FOOTPRINT WITH AN ENERGY MANAGEMENT SYSTEM

Companies that implement energy management systems reduce energy costs and increase business competitiveness, while also minimizing their environmental impacts. The ISO 50001 Implementation Incentive offers up to $80,000 of assistance to implement energy management projects that help facilities pursue compliance with the ISO 50001 standard. Learn more at: www2.gov.bc.ca/gov/content/industry/electricity-alternative-energy/innovative-clean-energy-solutions/innovative-clean-energy-ice-fund/iso-50001-implementation-incentive.

LNG FOR THE GLOBAL MARINE SECTOR

FortisBC is proposing to facilitate new investments in LNG marine bunkering in order to further transform the adoption of LNG as a marine fuel. This will also help position B.C. as a global marine bunkering centre on the west coast capable of providing LNG to a large number of natural gas vessels. The current level of global GHG emissions from ships coming into British Columbia is 70 million tonnes per year — higher than the total GHG emissions attributed to British Columbia in its entirety.

TAKING ACTION: NEW ENERGY EFFICIENCY STANDARDS FOR GAS FIRED BOILERS

Gas fired package boilers are used in industrial systems across the province, contributing to B.C.'s overall emissions profile. New technologies can be used to improve the efficiency of these boilers, which will reduce emissions and operating costs. As such, the Province will develop a regulation to be implemented by 2020 that will set energy efficiency requirements for new and replacement gas fired package boilers, driving down emissions across a number of industries.

GET INVOLVED: SAVE YOUR BUSINESS MONEY BY BECOMING MORE ENERGY EFFICIENT

Reduce the operating costs of your business by making energy efficiency upgrades. BC Hydro and FortisBC offer a variety of programs to help you improve your business' energy efficiency, including incentives for upgrades and opportunities to learn from experts. Find out more at: https://www.bchydro.com/powersmart/business/programs.html *and* https://www.fortisbc.com/Rebates/RebatesOffers/Pages/default.aspx.

TAKING ACTION: EXPANDING INCENTIVES TO PROMOTE ADOPTION OF EFFICIENT GAS EQUIPMENT

Gas fired equipment is used for a variety of purposes, from space and water heating in industrial processes, to home fireplaces and commercial cooking equipment. FortisBC offers incentives to promote adoption of more efficient gas equipment for the residential, commercial and industrial sectors.

Now the Province is taking action to amend the Demand-Side Measures Regulation and allow FortisBC to expand their incentives by at least 100 per cent, to encourage further adoption of technologies that reduce the emissions of gas fired equipment.

MINING THE SUN IN KIMBERLEY

The City of Kimberley launched an innovative project to convert Teck's former Sullivan Mine Concentrator site into a solar energy project called SunMine. It includes 4,032 solar-cell modules, mounted on 96 solar trackers that follow the sun's movement to maximize the amount of energy captured. This has made it B.C.'s largest solar project and Canada's largest solar tracking facility. It was also the first solar project in British Columbia to begin selling power back to the BC Hydro grid. This important project was made possible through the Province's Innovative Clean Energy Fund, as well as an investment from Teck, who provided the land and site infrastructure, as well as a $2 million contribution. SunMine is a community owned project that is well suited to capitalize on Kimberley's clear and sunny conditions.

Photo Credits: City of Kimberley

Action Area: Communities and Built Environment

WHY COMMUNITIES AND BUILT ENVIRONMENT MATTER

Communities and our built environment are key factors in the fight against climate change. While the built environment is a significant contributor to our overall emissions profile, it also represents a real ongoing opportunity for change.

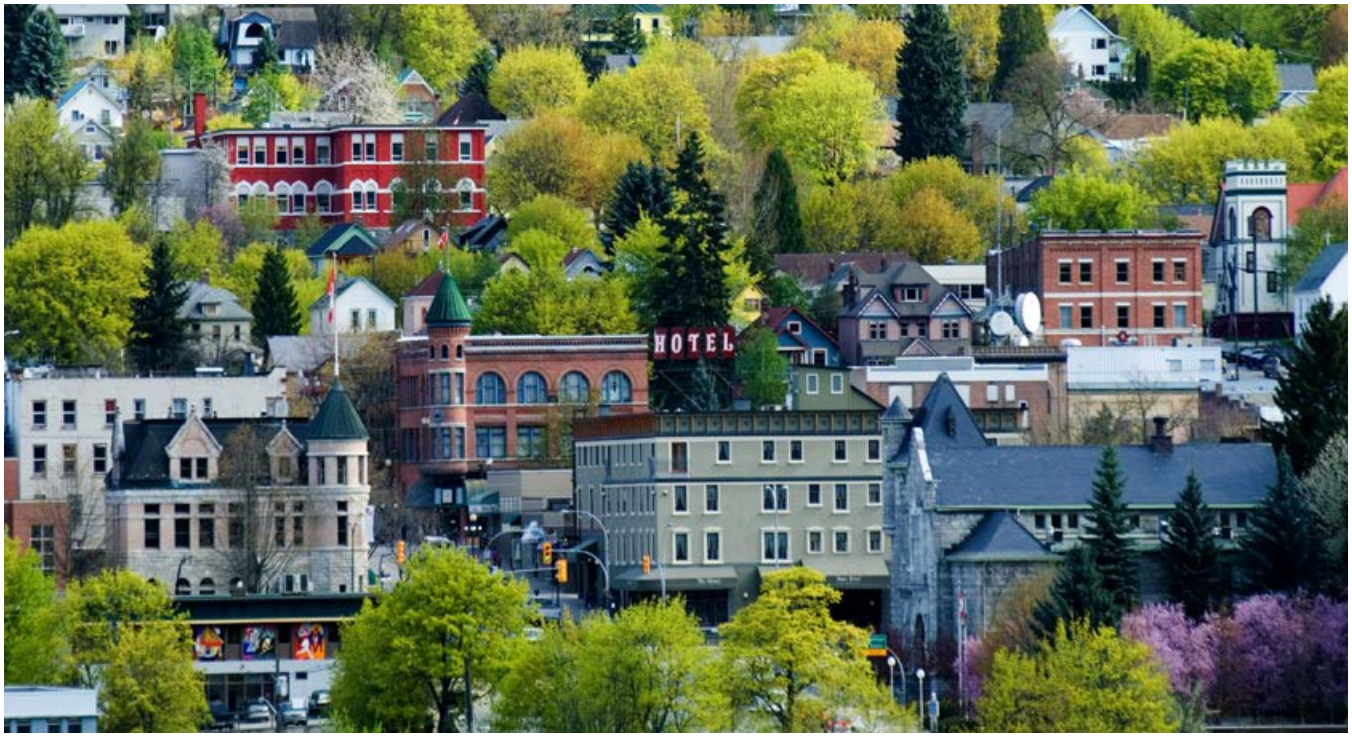
From the way we construct buildings to the way we develop communities and manage our waste, our built environment is a significant area where new innovations are demonstrating what a sustainable future could look like. However, we must balance our choices, to ensure that our climate solutions are affordable.

Emissions from the built environment (including buildings, deforestation and waste) represent 24 per cent of British Columbia's total emissions. Yet emissions in this area are down 9.4 per cent since 2007, due to climate action in community planning, building regulations and waste diversion.

Changes in the realm of communities and the built environment have been driven by policies such as Official Community Plans and Regional Growth Strategies, the Climate Action Charter, and the Climate Action Revenue Incentive Program, which returns the carbon tax to local governments to support GHG reduction projects.

The Building Code and Energy Efficiency Act have improved standards for residential and commercial buildings, while programs like LiveSmart BC and the Home Energy Retrofit Offer have promoted efficiency upgrades. In the area of waste, B.C.'s Landfill Gas Management Regulation has required landfill operators to increase the amount of methane they capture. 60 per cent of British Columbians have access to curbside organic diversion programs that are helping us reduce the amount of methane that will be emitted from waste we send to landfills every year.

With life spans of 50–100 years, today's buildings and infrastructure will impact our energy use and emissions for the next century. Incorporating climate action in planning and development leads to less energy and infrastructure spending. Over time, these actions will result in lower emissions and reduced congestion, as well as improved air quality, liveability and health.



NORTH VANCOUVER'S CLIMATE ACTION LEADERSHIP

The City of North Vancouver has shown how communities can make impressive strides to lead in the fight against climate change. It prides itself on being a compact community that puts pedestrians, cyclists, and transit first, and for reducing its corporate emissions by 19 per cent since 2007. Overall community emissions have decreased by 6 per cent between 2005 and 2010. The city has made this progress through initiatives that focus on sustainable energy, development planning that enhances public transit, building bike and pedestrian routes, and making upgrades to city buildings to make them more energy efficient.

TAKING ACTION: REGULATIONS FOR MORE ENERGY EFFICIENT BUILDINGS

Combustion of fossil fuels for heating in buildings accounts for the majority of building emissions. When we use fossil fuels, we need to make sure we are using them as efficiently as possible.

With 98 per cent of electricity generated in British Columbia coming from clean sources, promoting the efficient use of electricity represents another opportunity to cut emissions further. At the same time we must ensure that we do not intensify issues around housing affordability. That is why we are amending the energy efficiency standards regulation to include:

- Increased efficiency requirements for gas fireplaces and air source heat pumps, effective in 2018; and
- High-efficiency technology requirements for natural gas space and water heating equipment, effective in 2020 and 2025 respectively.

GET INVOLVED: USE THE FIRST NATIONS CLEAN ENERGY TOOLKIT

First Nations in British Columbia are well placed to take advantage of the clean energy sector.

The British Columbia First Nations Clean Energy Toolkit is a step-by-step manual designed to inform First Nations about the kinds of clean and renewable energy sources available, how to begin looking into doing a clean energy project, and where to find resources.

Check it out at: https://www.cleanenergybc.org/wp-content/uploads/2016/04/BC-FN-Toolkit.pdf.

TAKING ACTION: ENCOURAGING DEVELOPMENT OF NET ZERO BUILDINGS

Cleaner, more energy-efficient buildings can save owners and tenants money in the long run by lowering energy costs and avoiding carbon costs. Additionally, improved building envelopes and efficient technologies such as new heat pumps can make significant improvements in buildings. As such, we are implementing a number of policies to encourage the development of net zero buildings, including:

- Accelerating increased energy requirements in the BC Building Code by taking incremental steps to make buildings ready to be net zero by 2032;
- Developing energy efficiency requirements for new buildings that go beyond those in the BC Building Code, called Stretch Codes, that interested local governments could implement in their communities; and
- Creating innovation opportunities and financial incentives for advanced, energy-efficient buildings, including an increase in funding for design and innovation.

The international Passive House standard is one of the most rigorous and advanced building performance standards in the world, achieving reductions in heating energy of up to 90 per cent compared to other buildings. Through a partnership between the Province's Innovative Clean Energy Fund and the Canadian Passive House Institute, architects, builders and building inspectors are receiving training in Passive House design principles.

GET INVOLVED: LEARN ABOUT PASSIVE HOUSING DESIGN

Take a passive house design course and find out about training subsidies for building professionals at: http://canphi.ca/passive-house-courses/.

TAKING ACTION: REFRESHING THE CLIMATE ACTION CHARTER FOR COMMUNITIES

The Climate Leadership Team recommended that British Columbia update the Climate Action Charter to align provincial and community goals. In response, we are refreshing our actions under the Climate Action Charter this year, which sets out a framework for British Columbia communities to become carbon neutral and to create complete, compact, energy-efficient urban and rural communities.

The Province will work with local governments to expand the progress made to date on reducing GHG emissions. The goal is to establish a plan for community action that takes advantage of provincial and federal actions, to maintain momentum at the community level through policies, programs and regulations that will:

- Focus growth near major transit corridors for large urban communities;
- Increase the use of decision support tools that provide the information needed to create more resilient green infrastructure; and
- Strengthen the ability of communities to adapt to the impacts of climate change.

GET INVOLVED: UPGRADE YOUR HOME'S ENERGY EFFICIENCY

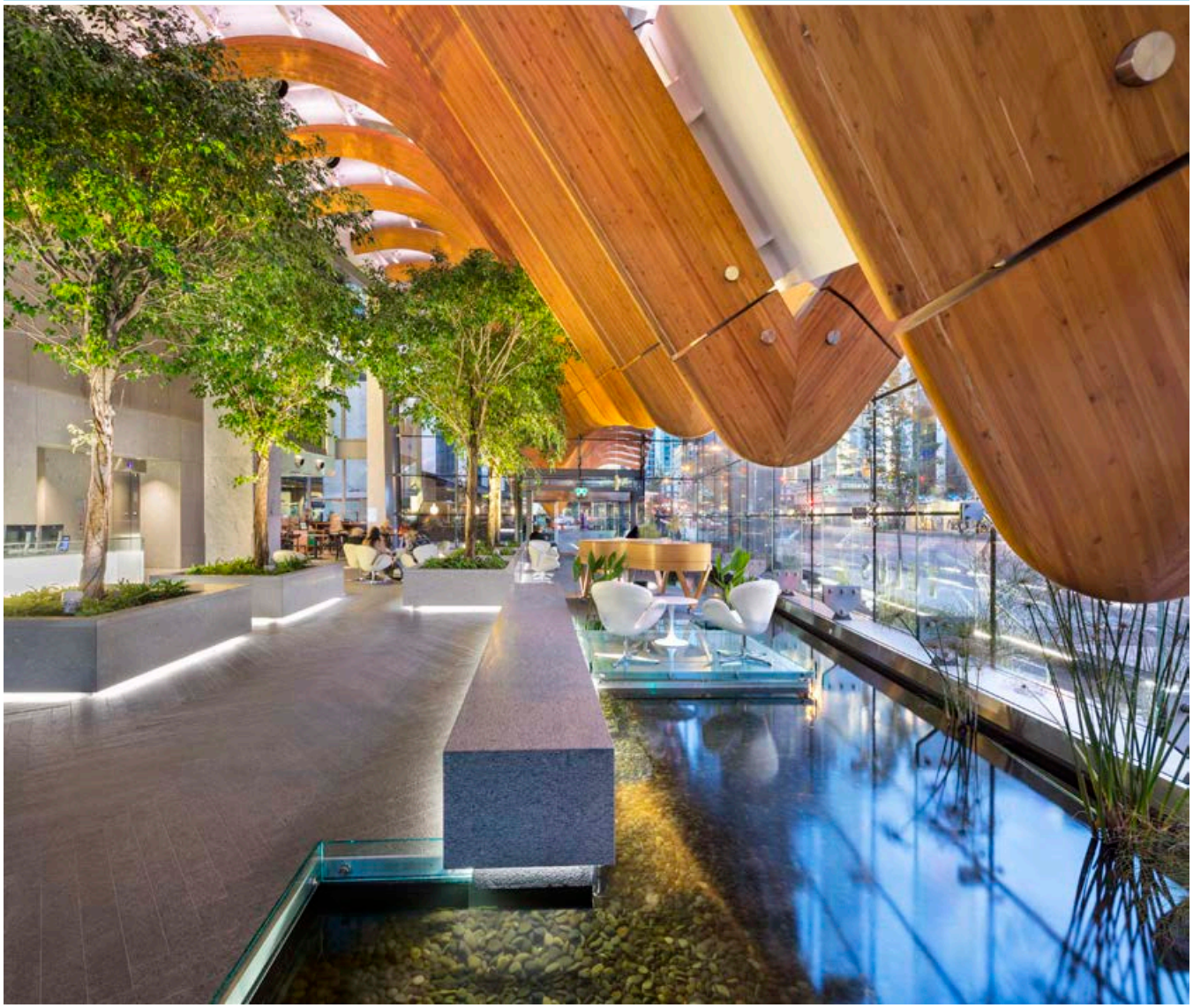
Home energy efficiency upgrades are a great way to save money and protect the environment. Did you know you can receive a rebate of up to $1,700 for upgrading from oil heating to an electric heat pump?

For more information on this and other programs, check out British Columbia's energy efficiency programs: www2.gov.bc.ca/gov/content/industry/electricity-alternative-energy/energy-efficiency-conservation/programs.

TELUS GARDEN AWARDED LEED PLATINUM CERTIFICATION

TELUS Garden, the company's new office in downtown Vancouver, is one of North America's greenest buildings. That is why the Canada Green Building Council awarded it the prestigious Leadership in Energy and Environmental Design (LEED) Platinum certification and it also received the impressive 2016 Architizer A+ Award for Office High Rise. Its innovative design includes: a district energy system that recovers energy that would normally be wasted and uses it to heat and cool air and water for both the office and residential towers, as well as the retail space; Vancouver's largest solar panel array; a rainwater capture system to irrigate its 10,000 sq. ft. of garden terraces; high-efficiency motion sensor lighting; charging stations for electric vehicles; and numerous other design elements that improve its environmental performance.

These sustainability features will contribute to a reduction in carbon emissions of more than 1,000 tonnes annually. Its innovative design was inspired by nature and advances the company's mission to create a healthier, more sustainable future, demonstrating what the built environment of the future could look like.



TAKING ACTION: CREATING A STRATEGY TO TURN WASTE INTO RESOURCES

Landfill waste is a significant source of emissions, and an area where significant opportunity for improved performance on GHG emissions exists. The CLT recommended that British Columbia create a waste-to-resource strategy that reduces GHG emissions from organic waste. In response, we are taking the following actions:

- Supporting materials exchange pilot projects that create innovative uses for waste products;
- Creating a waste-to-resource strategy to reduce waste sent to landfill; and
- Establishing a food waste prevention target of 30 per cent and increasing organics diverted from landfills to 90 per cent.

These actions are expected to reduce annual GHG emissions by up to 1.4 million tonnes.

TURNING WASTE INTO ENERGY

Emergent Waste Solutions (EWS) is a B.C. business that is deploying clean tech solutions to turn waste into valuable products and reduce greenhouse gas emissions, without using incineration.

Using a process called thermolysis, EWS's technology produces carbon from waste, such as wood fibre, rubber and plastics, for a wide variety of applications including biochar for agricultural uses, activated carbon for filtration, and carbon black for rubber product applications. The energy byproducts are syngas, used primarily to power its own operations, as well as bio oil and light diesel fuel, which can be used for home heating and other applications. Beyond the potential applications of this technology in B.C., EWS is opening a plant in Alberta, helping our neighbours turn their waste into valuable resources.

Action Area: Public Sector Leadership

WHY PUBLIC SECTOR LEADERSHIP MATTERS

Public sector operations are present in almost every community in the province, through schools, universities, colleges, crown corporations, health care services and others. B.C.'s public sector is also a significant buyer of clean tech goods, equipment and services.

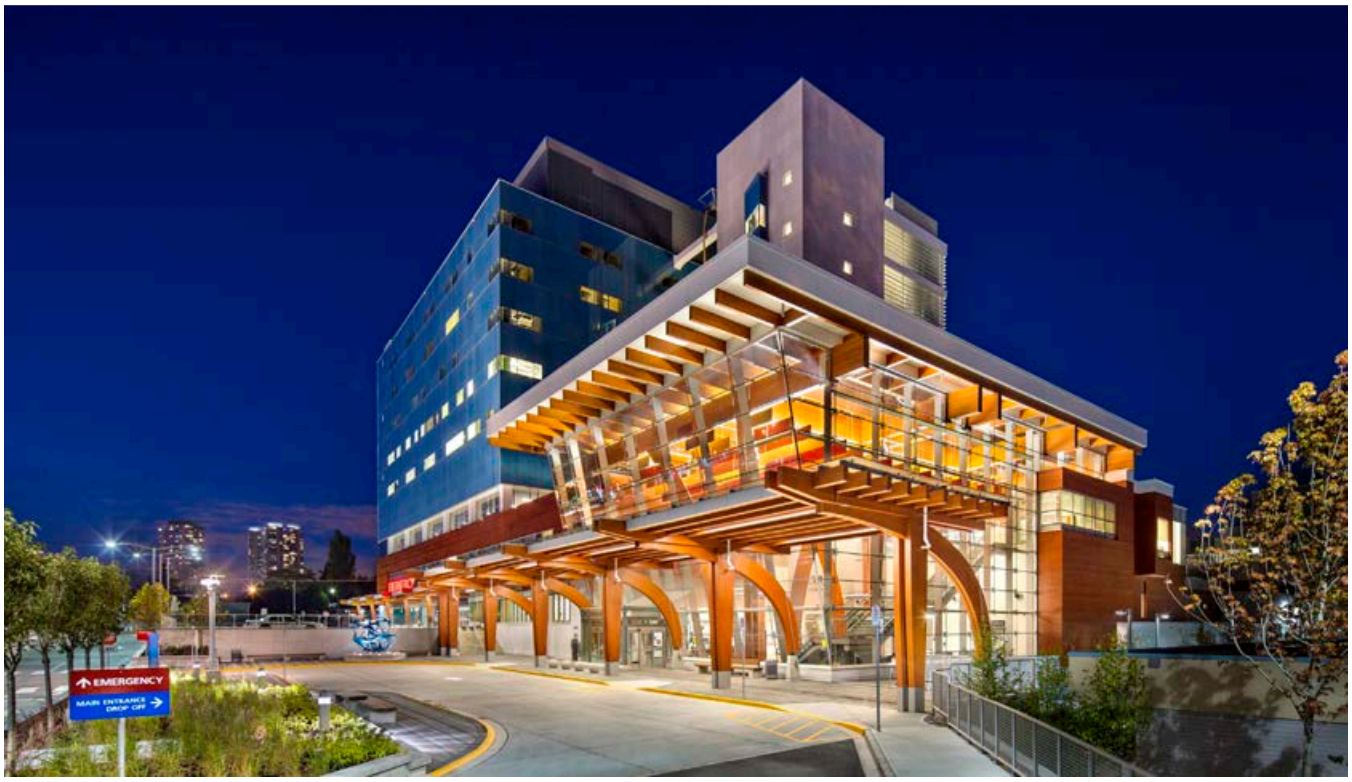
As such, the Province is well positioned to serve as a catalyst for climate action at both the community and provincial levels. Public sector leadership engages 300,000 public servants to take action on climate change, and in turn reaches the two million British Columbians that work, learn or visit government buildings each year. Buildings account for almost 77 per cent of B.C.'s provincial public sector emissions.

That is why as of 2010, the Greenhouse Gas Reduction Targets Act has required all public sector organizations (PSOs) to operate at carbon neutral. The Carbon Neutral Government commitment is achieved by measuring and reducing PSO emissions and offsetting the remainder by purchasing carbon offsets.

Over the first six years of this commitment, the provincial public sector has successfully achieved carbon neutrality each year, reducing a total of 4.3 million tonnes of emissions through reduction activities and investment of $51.4 million in offset projects.

SURREY'S HIGH PERFORMANCE HOSPITAL

In 2014, the Fraser Health Authority partnered with Integrated Team Solutions to deliver a state-of-the-art critical care tower at Surrey Memorial Hospital. Recently LEED Gold certified, the eight storey tower incorporates efficient and sustainable design solutions, including air-to-water heat pumps, central lighting controls and electric vehicle charging stations. The tower, with estimated annual emissions of less than 1,100 tonnes $C0_2e$, is predicted to save nearly 4 GWh equivalent of energy each year compared to a standard building.



PhotoCredit: Ed White Photographics

TAKING ACTION: PROMOTING USE OF LOW CARBON AND RENEWABLE MATERIALS IN INFRASTRUCTURE

Public sector infrastructure represents a considerable portion of B.C.'s built environment and is an area where the Province is demonstrating leadership in taking action to reduce GHG emissions. That is why we are developing policies to increase the use of low carbon and renewable materials in all public sector infrastructure, including:

- Approving use of Portland-limestone cement in public sector infrastructure. This material reduces GHG emissions associated with existing cement manufacturing by approximately 10 per cent, while producing concrete with similar strength and durability. This cement has been popular in Europe for over 25 years now, but is new to Canada; and
- Increasing use of B.C.'s wood products that store carbon and reduce emissions, through our Wood First program that drives innovation in forestry products, while promoting climate-friendly construction and supporting our forest-dependent communities.

GET INVOLVED: IMPROVE YOUR ENERGY MANAGEMENT PRACTICES

Looking for ways to improve the energy efficiency of your organization?

Check out FortisBC's Commercial Custom Design Program to learn about natural gas upgrade opportunities and their Custom Business Efficiency Program for electricity upgrade opportunities for customers. Learn about the full range of energy management programs for BC Hydro customers.

Find out more at:
https://www.fortisbc.com/Rebates/RebatesOffers/Pages/default.aspx?type=business *and* https://www.bchydro.com/powersmart/business/programs/partners.html.

TAKING ACTION: REDUCING EMISSIONS AND PLANNING FOR ADAPTATION IN THE PUBLIC SECTOR

It is important for the Province to lead the way on developing emission reductions and adaptation planning strategies, and demonstrating them through our public sector operations. Not only does it reduce the overall emissions profile of our province, it helps industry and individuals understand how they can join the fight against climate change. These areas were clear priorities for public sector leadership that were identified in the CLT's recommendations.

To continue capitalizing on this opportunity, the Province is committing to:

- Developing guidelines for public sector operations to reduce emissions and plan for climate change adaptation; and
- Mandating the creation of 10-year emissions reduction and adaptation plans for provincial public sector operations.

CANADA'S GREEN UNIVERSITY

A forestry seedling greenhouse started the University of Northern British Columbia (UNBC) on the road to using renewable energy. Now the Prince George university is the first in Canada with its own wood-fuelled district heating system and has been branded as "Canada's Green University." This system, designed by Vancouver-based clean tech company Nexterra, uses wood pellets made from wood waste such as sawmill shavings from Prince George's local forestry industry to create bioenergy. This energy is then used to heat water, which is circulated to the existing hot water district heating system that heats the UNBC campus. This has reduced fossil fuel consumption at UNBC by 72 per cent, avoiding 3,700 tonnes of carbon emissions every year. This has shown both the City of Prince George, as well as visiting students and faculty, what is possible when you use wood waste as a fuel.

GOING SOLAR AT THE COLLEGE OF THE ROCKIES

The College of the Rockies has installed solar panels on the roof of the Cranbrook campus' Kootenay Centre, which will allow it to generate electricity year-round. This solar technology will produce 109,000 kilowatt-hours per year of electricity, enough to power 14 houses in the region for a year. It will also act as a teaching tool for students, both during construction and once the system is running. This project will continue the college's mission to be leaders in alternative energy, having already installed solar technology to power the heating system for their residence building, and a solar wall at Pinnacle Hall that draws heat into the building, improving air quality and reducing heating costs.

Next Steps on Climate Leadership

Taking action on climate change is a critical priority for the Province of British Columbia and the citizens we serve. In B.C., we know that climate action is necessary to protect our environment, while seizing the opportunity of a low carbon economy that creates good jobs for British Columbians.

We are committed to achieving B.C.'s goal of reducing GHG emissions to 80 per cent below 2007 levels by 2050. However, the pathway to that goal is not always clear, as true sustainability means balancing environmental, economic and social concerns. An action that improves environmental performance cannot be considered sustainable if it works against our economic competitiveness, driving jobs and emissions to other jurisdictions, or if it raises the cost of living so that British Columbians struggle to make ends meet. There is no silver bullet here — real climate action demands careful planning, a flexible approach, and coordination with our partners here in Canada and around the world.

The federal government has signalled a reinvigorated commitment to climate action, and we look forward to the opportunity to help develop a Pan-Canadian Framework later this year, which will align provincial policies to work together to achieve our GHG reduction goals.

While there are areas we know we still need to take action on, many are dependent on our work with the federal government, whether that means identifying additional available funding opportunities or developing policies that align with our provincial and territorial partners to protect B.C.'s economic competitiveness.

A key area that we know will require further action is carbon pricing. Our carbon tax already leads the country — now we must work with our provincial and federal partners to develop a carbon pricing model that works for all. It is a complex issue that will require extensive coordination to ensure that it is effective.

We know that First Nations are interested in ensuring their communities are prepared to adapt to climate change, and are able to capture the economic benefit of mitigation activities, including reforestation and clean energy projects. With the establishment of this new framework for provincial action on climate change, the Province will be seeking the participation of First Nations in the economic and adaptation opportunities we have identified. We look forward to collaborating with them to capitalize on these new opportunities.

Another key area where you can expect to hear more in the coming year is adaptation. In 2010, the Province created a comprehensive strategy to address the changes we will see in B.C. as a result of climate change. We are now working with the federal government and other Canadian jurisdictions to improve our management of the risks associated with a changing climate.

The Province is also collaborating internationally through the Regions Adapt Initiative and the Pacific Coast Collaborative. Recent investments in flood protection and forest stewardship here in British Columbia will also increase our resilience to a changing climate.

Adapting to a changing climate depends on action by all levels of government, the private sector and civil society. As we move forward on climate action, we will look to maximize opportunities to extend our leadership in responding to the impacts of a changing climate.

While the actions we have outlined here represent what we can do today, it is important that we lay the foundation to support solutions with the potential to make an even bigger impact. That is what programs like British Columbia's Innovative Clean Energy (ICE) Fund are designed to do.

A recent investment from the ICE Fund is generating a lot of excitement — Carbon Engineering Ltd. has built the world's first direct air capture plant in Squamish. This technology captures atmospheric carbon dioxide right out of the air, and targets emissions that traditional fluestack carbon capture cannot reach. Their demonstration plant is already capturing and purifying a tonne of CO_2 every day. Carbon Engineering is looking at ways to turn the captured CO_2 into fuels like gasoline and diesel, which upon combustion would simply return the carbon to the air.

These innovations, along with continued deployment of clean and renewable electricity generation, could allow for the mass production of low carbon fuels, helping the world become less reliant on fossil fuel production and consumption. The technology represents an enormous opportunity for B.C. to bolster its economy while fighting climate change.

The Province will continue to identify opportunities where we can reduce GHG emissions today, while working with our partners to plan for the future, and investing in innovative projects that can help us reach our 2050 target even sooner. Additionally, our Climate Leadership Plan will be updated over the course of the following year as work on the Pan-Canadian Framework on climate action progresses.

We hope that you will get engaged, do your own part where you can, and continue to work with us on this important mission. If we want to ensure a great future for our children and grandchildren, then climate action must be a key priority. Join us in imagining what this bright future looks like and in taking action to make it a reality.

Sincerely,

HONOURABLE MARY POLAK
MINISTER OF ENVIRONMENT

Photo Credit: Stephen Hui

Appendix

Summary of Action Areas

The table on the following page summarizes the 21 climate actions across 6 sectors.

Emission reductions have been forecast through economic modelling or direct calculation by the responsible ministries. Input/output modelling was used to forecast cumulative direct and indirect economic activity (Gross Domestic Product) and jobs resulting from policies, except forest sector policies, which were forecasted by the Ministry of Forests, Lands and Natural Resource Operations.

The input/output modelling was undertaken using relevant economic and jobs factors provided by BC Stats.

All numbers in the following table are forecasts and subject to final policy decisions and budgets.

* *25,000,000 tonnes CO_2e is equal to 8.3 million new cars off the road for a year.*

An average B.C. house creates 2 tonnes CO_2e per year. 25,000,000 tonnes CO_2e is equal to the emissions from 12.5 million B.C. homes in one year.

Action Areas	Emission Reductions in 2050 (Millions of tonnes CO_2e)	Job Creation	Economic Activity ($ Millions)
NATURAL GAS	**5**	**4,043**	**527**
» Strategy to Reduce Methane Emissions » Regulating Carbon Capture and Storage » Electricity to Power Natural Gas Production and Processing			
TRANSPORTATION	**3**	**41,525**	**4,573**
» Increasing the Low Carbon Fuel Standard » Incentives for Renewable Natural Gas » Incentives for Purchasing a Clean Energy Vehicle » Charging Stations for Zero Emission Vehicles » 10-Year Plan to Improve B.C.'s Transportation Network			
FORESTRY & AGRICULTURE	**12**	**19,942**	**681**
» Enhancing the Carbon Storage Potential of B.C.'s Forests » Nutrient Management Program			
INDUSTRY & UTILITIES	**2**	**554**	**53**
» Making B.C.'s Electricity 100% Renewable or Clean » Efficient Electrification » Fuelling Marine Vessels with Cleaner Burning LNG » New Energy Efficiency Standards for Gas Fired Boilers » Expanding Incentives for Efficient Gas Equipment			
BUILT ENVIRONMENT	**2**	**230**	**19**
» Regulations for More Energy Efficient Building » Encouraging Development of Net Zero Buildings » Refreshing the Climate Action Charter for Communities » Strategy to Turn Waste into Resources			
PUBLIC SECTOR LEADERSHIP	**1**	**3**	**–**
» Promoting Use of Low Carbon and Renewable Materials in Infrastructure » Reducing Emissions and Planning for Adaptation in the Public Sector			
TOTAL	**25***	**66,297**	**5,853**

Notes

Notes

FOR MORE INFORMATION VISIT THE WEBSITE:
GOV.BC.CA/CLIMATELEADERSHIP

BRITISH COLUMBIA

Alberta Government

Climate Leadership Plan

Progress Report

2016-17

TABLE OF CONTENTS

CLP Progress Report 2016-17 2

What it is and what is included 2

Alberta's Climate Leadership Plan 3

What Alberta is doing and why it matters 3

Measuring and Reporting Progress 4

How Alberta is monitoring, evaluating and reporting progress 4

REPORTING OUR RESULTS

Changing our GHG Emissions Path 7

How Alberta's greenhouse gas emissions are expected to change over time 7

Action Areas 11

Policy and Legislation 13

Renewable Energy 28

Energy Efficiency 45

Clean Technology and Transit 64

Support and Engagement 85

Skills and Employment in Green Sectors 104

What's Next 108

What Alberta is working on in the immediate future 108

Appendix 109

Methodology 109

CLP Outcome Framework 110

Index of CLP Programs and Initiatives 111

CLP PROGRESS REPORT 2016-17

The Climate Leadership Plan (CLP) is a made-in-Alberta strategy that brings together government, business, industry and the public to diversify our economy, create jobs and reduce greenhouse gas emissions (GHG) that cause climate change. The CLP Progress Report gives Albertans an update on the actions taken and the progress made towards achieving the goals set out in the CLP that was announced in November 2015.

The CLP is designed for Alberta's economy, and it is working. We're seeing success in reducing emissions, investments in innovation, energy efficiency, renewables, and good jobs that are putting Albertans back to work. This Progress Report includes:

- A description of what Alberta is working to achieve – CLP outcomes in the short, medium and long term.
- An update on what Alberta is achieving in its one to five-year action areas.
- An update on the programs and initiatives designed to move towards achieving the CLP outcomes.

This report outlines how the Government of Alberta will measure, evaluate and report on both progress made as we pursue our goal of reducing GHGs and other important outcomes.

As well, this report shows that the Government of Alberta has established rigorous monitoring and performance measurement for the CLP. As additional programs are implemented and more results are tracked, the measures and indicators will be refined to better meet the evolving needs of the public and decision-makers.

This report covers calendar year 2016 (with preliminary results for a few initiatives started in 2017). Investment dollars and program results tables are based on the fiscal year of April 1, 2016 to March 31, 2017.

ALBERTA'S CLIMATE LEADERSHIP PLAN

In November 2015, the Government of Alberta introduced the Climate Leadership Plan. It is a made-in-Alberta strategy to reduce carbon emissions while diversifying our economy, creating jobs and protecting our health and environment.

WHY ALBERTA MUST ACT

Alberta emitted 38 per cent of Canada's greenhouse gas emissions in 2015, the highest of any province. In addition to being a significant global environmental threat, Alberta's contribution to the climate change crisis had started to create reputation challenges that were impacting business: investment and market access were both threatened by continuing the status quo. Alberta took decisive action to curtail emissions—to protect the environment, and to create jobs by growing the modern Alberta economy, including improved access to world markets for our responsibly produced energy.

AN ALBERTA-FIRST STRATEGY

The government established a Climate Change Advisory Panel to advise it on the best way to take action. The Panel's report forms the foundation of the CLP and includes four main policy measures:

- Implement a new price on greenhouse gas emissions, or carbon pricing.
- Phase out pollution from coal-generated electricity by 2030 and triple renewable energy so by 2030, 30 per cent of electricity is generated from renewable sources.
- Cap oil sands emissions at 100 megatonnes (Mt) in any year.
- Reduce methane emissions from upstream oil and gas production by 45 per cent from 2014 levels by 2025.

MEASURING AND REPORTING PROGRESS

In 2016, mechanisms were put in place to ensure efficient and effective implementation of the CLP. The government, through various ministries and agencies, and reflecting recommendations in the Climate Change Advisory Panel's report, established a set of clearly defined outcomes and desired results. This outcome framework (included in the Appendix) forms the foundation for CLP programs and policies to:

- Map alignment to CLP's outcomes.
- Identify measures/indicators to monitor, report and evaluate progress.
- Evaluate relevancy and effectiveness of CLP funding requests, policies and programs.

The performance framework described below provides the structure for measuring and reporting progress on the CLP.

WHAT IS ALBERTA WORKING TO ACHIEVE?

The CLP ultimately aims to achieve **Reduced Greenhouse Gas Emissions** while also working towards a **Lower Carbon Diversified Economy** and **Increased Community Health and Wellbeing.**

Ultimate Outcomes

HOW FAST? HOW FAR?

Reducing GHG emissions takes concerted effort by many contributors over many years. Recognizing that many of these factors are outside of its control, the government has set clear targets where it can make an impact.

Targets:

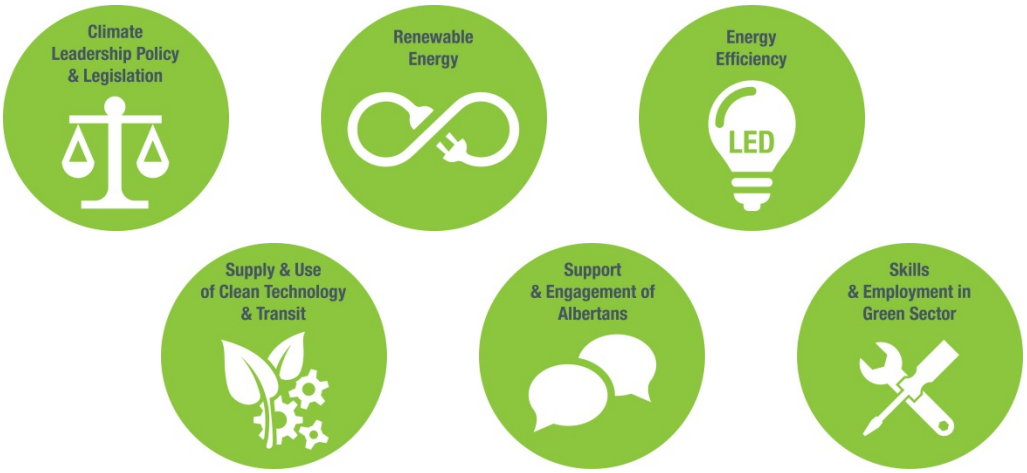
- 2017 and On – Annual **oil sands emissions are <100 Mt.**
- 2025 – Annual **methane emissions from upstream oil and gas are decreased by 45 per cent** from 2014 levels (14 MT GHG emissions ↓).
- 2030 – Pollution from **coal-generated electricity is ZERO** (17 Mt GHG emissions ↓).
- 2030 – **30 per cent** of electricity produced in Alberta is **from renewable energy sources** (7 Mt GHG emissions ↓).

Megatonne GHG emission reductions are estimated based on data and information available in the current reporting period. They may be updated in subsequent reporting.

HOW WILL WE GET THERE?

Achieving these targets and our ultimate outcomes depends on effort and change by us all: government, business, industry and the public. We all have a role. Government can establish Alberta as a **climate leader**, business and industry can **accelerate the adoption of clean innovation**, and Albertans can **actively participate in green practices**. To encourage these changes, the CLP focuses on six action areas:

Action Areas



CLP Programs and Policies

Each of the programs and policies links to one or more of the action areas and has defined accountabilities. Examples of CLP programs and policies include:

- Indigenous Climate Leadership Initiative.
- Emissions Reduction Alberta.
- Energy Efficiency Alberta.
- Renewable Electricity Program.

HOW WILL WE KNOW WE ARE ON THE RIGHT TRACK?

The performance framework mentioned above – the ultimate outcomes, action areas, and the contributing programs and policies – forms the structure for measuring and reporting progress. And the CLP Progress Report updates Albertans on how well we're doing to meeting the goals we set out to achieve.

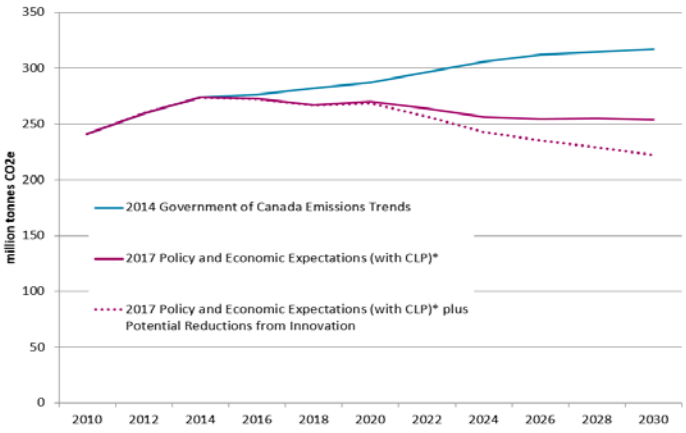
REPORTING OUR RESULTS

REDUCED GREENHOUSE GAS EMISSIONS

Alberta's CLP policies, legislation and programs all drive towards reduced greenhouse gas emissions and changing Alberta's emissions path. Progress on reductions is monitored through actual results reported in the Government of Canada's National Inventory Report on Greenhouse Gas Sources and Sinks, as well as modelled forecasts of future emissions. The historical results for Alberta's GHG emissions measured in megatonnes of carbon dioxide equivalent, as well as forecasted emissions, are shown in Figure 1. Forecasted emissions are based on the Alberta Climate Change Office's (ACCO) internal analysis and the methodology is described in the Appendix.

Impacts of CLP policies and programs are expected as early as 2017 with a decrease from Canada's Emissions Trends 2014 (blue line in Figure 1). The decrease in emissions (solid pink line) reflects changing expectations of Alberta's economy (such as impacts of lower world prices for oil) combined with the actions from the CLP and other federal climate change policies. Included in this is the impact of the CLP implemented carbon price rising from $30 to $50 for large industrial facilities and the application of the carbon levy to move towards economy-wide carbon pricing.

Figure 1. Actual and Estimated GHG Emissions for Alberta



* Includes Alberta's Climate Leadership Plan and federal climate policies.

Data source: Environment and Climate Change Canada – National Inventory Report 1990-2015: Greenhouse Gas Sources and Sinks in Canada; Environment Canada – Emissions Trends 2014; ACCO Internal Analysis

Table 1: Actual and Estimated GHG Emissions for Alberta (Megatonnes of CO_2 equivalent)

Year and Considered Policy/ Economic Expectations	Reported Results			Forecasted Results							
	2010	2012	2014	2016	2018	2020	2022	2024	2026	2028	2030
2014 Government of Canada Emissions Trends	241	260	274	277	282	287	297	306	312	315	317
2017 Economic Trends and Federal Climate Policies, 2014 Alberta Climate Policies (No CLP)	241	260	274	274	285	286	289	296	296	297	293
2017 Policy and Economic Expectations (with CLP)*	241	260	274	273	267	270	264	256	255	255	254
2017 Policy and Economic Expectations (with CLP)* plus Potential Reductions from Innovation	241	260	274	273	267	268	256	243	235	229	222

* Includes Alberta's Climate Leadership Plan and federal climate policies.

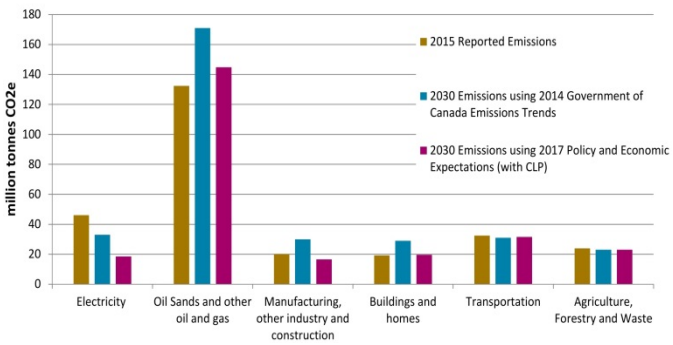
The downward trend in emissions is forecasted to continue with the expected decreases in the oil and gas sector's methane emissions and electricity sector emissions. These decreases are expected to be complemented by large industrial facilities' investment decisions in response to the incentive structure created by carbon competitiveness incentives, rising carbon prices up to $50 in 2022 (based on the rate identified in the Pan-Canadian Framework on Clean Growth and Climate Change) and the expiry of the carbon levy exemption for upstream oil and gas. Further reductions from building improvements in the residential, commercial and institutional sector and in transportation are expected to occur as a result of the carbon levy and program incentives. GHG emissions can be further reduced through the impact of clean technology investments, represented as a dotted line.

GHG EMISSIONS BY SECTOR

Alberta's GHG emissions reflect the structure of our economy. A substantial share of our emissions is from oil and gas and other large industrial sources. Changing Alberta's emissions path requires strategies aimed at these sectors, while recognizing that they compete in international markets and are therefore trade-exposed.

Figure 2 compares Alberta's emissions by sector for 2015 to projected 2030 emissions under Canada's Emissions Trends 2014, along with the current forecast considering today's economic outlook and the expected impacts of the CLP (pink bars). The difference between the heights of the blue and pink bars reflects a combination of the decrease due to changed economic growth, impacts of federal policies and the projected GHG emissions reductions from the CLP. The potential emissions reductions from research and innovation (not shown in Figure 2) would further reduce the height of the pink bars. Ongoing monitoring and reporting of results will inform how closely we are moving towards these forecasted reductions.

Figure 2. Alberta's Annual Emissions by Sector – Comparison of 2015 Actuals to 2030 Forecasts



* Includes Alberta's Climate Leadership Plan and federal climate policies.

Data source: Environment and Climate Change Canada - National Inventory Report 1990-2015: Greenhouse Gas Sources and Sinks in Canada; Environment Canada – Emissions Trends 2014; ACCO Internal Analysis

Table 2: Alberta's Annual GHG Emissions by Sector – Comparison of 2015 Actuals to 2030 Forecasts (Megatonnes of CO_2 equivalent)

Sector	2015 Reported Emissions	2030 Forecasted Emissions	
		2014 Government of Canada Emissions Trend	2017 Policy and Economic Expectations (with CLP)
Electricity	46	33	19
Oil Sands and Other Oil and Gas	132	171	145
Manufacturing, Other Industry and Construction	20	30	17
Buildings and Homes	19	29	20
Transportation	32	31	32
Agriculture, Forestry and Waste	24	23	23
Total Provincial Emissions	274	317	254

ADDITIONAL BENEFITS

Although the CLP's primary outcome is reduced GHG emissions, its strategies also generate additional benefits. For example, by investing in and incenting the development of clean technology and fostering the growth of an energy efficiency industry, the CLP contributes to a more diversified lower carbon economy. Likewise, phasing out coal emissions reduces pollutants and contributes to improved air quality and associated health benefits. In the following sections, results associated with all three of these ultimate outcomes are reported on.

ACTION AREAS

There are six action areas where Alberta will focus its efforts over the next few years. The Action Areas section provides the following information for each area (with the exception of Skills and Employment in Green Sectors).

OBJECTIVES AND TARGETS

'Objectives and Targets' describes specific objectives that further define each action area and identifies any associated CLP targets most directly attributable to the action area.

STRATEGIC INVESTMENTS

Strategic Investments identifies the 2016-17 fiscal year expenditures allotted to help achieve the relevant action area. The estimated impacts of this investment on supported jobs for 2016-17 and cumulative GHG emissions reductions to 2020 are also provided. This illustrates how carbon levy revenue is being invested to support the achievement of the CLP. The methodology for the calculated estimates is included in the Appendix.

PROGRESS SUMMARY

Progress Summary provides the suite of measures/indicators/information that helps monitor progress towards achieving the action areas. Where available, the progress summary identifies the CLP baseline, the current result, the target or desired result, the trend and status. Targets include only those CLP-specified targets. Trends are calculated using the reported historical and actual data for each associated measure. Status is calculated using linear projections to the target year and comparing the projected result against target, except where there is a known target profile that is non-linear (for example, legislated requirements). Where historical data are not available, year-over-year change is used.

- ▲ Positive upward trend
- ▼ Positive downward trend
- ▲ Negative upward trend
- ▼ Negative downward trend
- — Steady trend
- ● Projected to meet or surpass target
- ● Projected to be near target (within 20% of target)
- ● Projected to be off target (more than 20% off target)

PROGRESS DETAIL

For each of the measures/indicators/information included in the Progress Summary, the Progress Detail includes:

- A description of the measure/indicator including methodology and data source.
- The importance and significance of each measure/indicator.
- The associated target or desired result. Targets are the four identified CLP commitments. Desired results reflect positive performance and in some cases may refer to a milestone.
- A description of progress.

PROGRAM RESULTS

Programs contributing to the action areas are identified as primary, supporting or additional. Primary contributors are those programs included in the particular strategic investments. Program milestones, 2016-17 investments, next steps and estimated cumulative GHG emissions reductions are provided for the programs within the relevant action area.

POLICY AND LEGISLATION

OBJECTIVES AND TARGETS

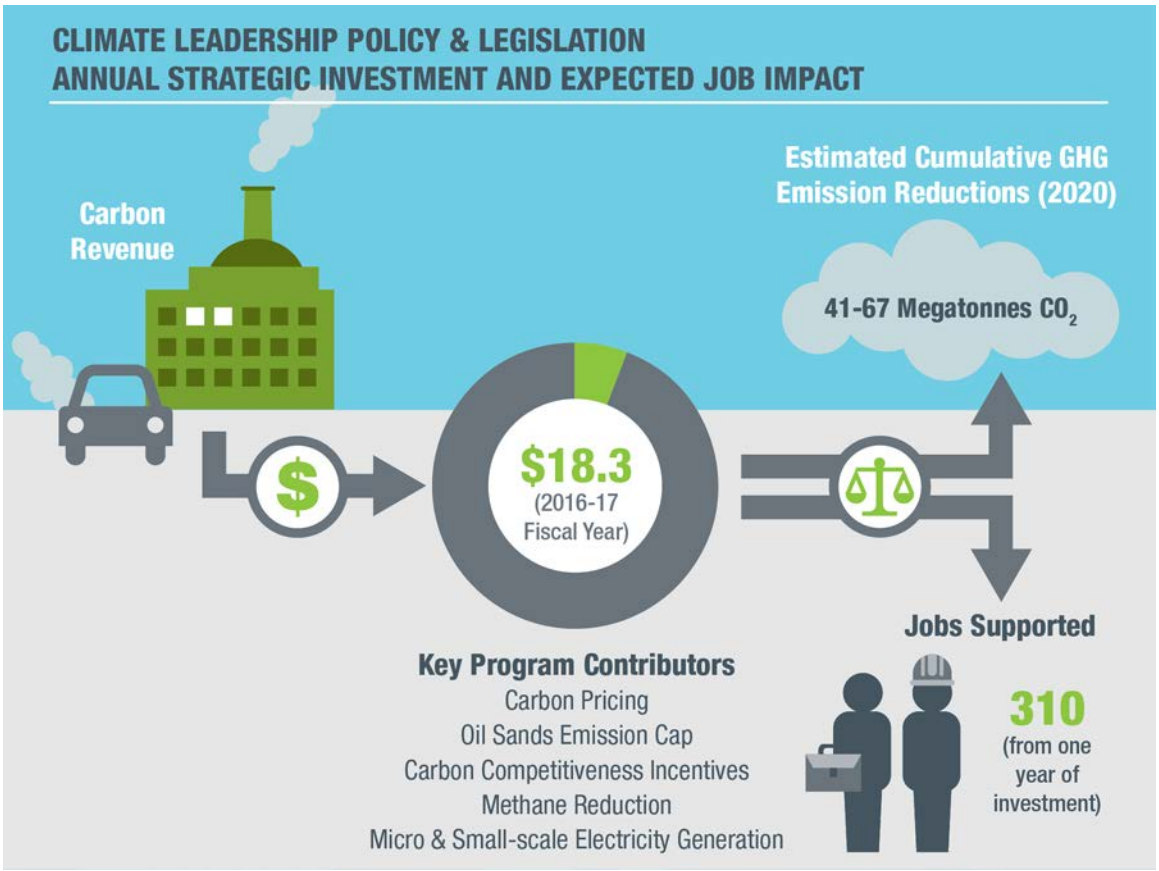
Climate policy and legislation are the Government of Alberta's key tools to both encourage behavior change and enable the delivery of programs designed to reduce GHG emissions. As a jurisdiction rich in fossil fuels, and an energy sector that plays such a large role in our economy, Alberta must demonstrate leadership in addressing climate change, while recognizing the significance of the implications of climate policies. Strengthened climate leadership policy and legislation focus on the following objectives and targets:

- **Incent and enable emissions reductions in a consistent, integrated and predictable approach.**
  - Policy suite includes carbon pricing, oil sands emissions limit, methane emissions target and complementary legislation.
- **Reduce greenhouse gas emissions** in Alberta and specifically from regulated sectors while maintaining competitiveness.
  - Target: **45 per cent reduction in methane emissions from oil and gas operations by 2025** (from 2014 levels).
  - Target: **Limit oil sands emissions to less than 100 Mt in any year.**
- **Ensure a collaborative approach to the design and application of policy and legislation.**
  - Regulatory alignment with the federal government.
  - Industry and other regulated sectors and groups understand and comply with regulations.

The CLP takes action to mitigate climate change by reducing GHG emissions. We also recognize that there are real-time effects of climate change being experienced by Albertans. The government is currently working with partners to build an adaptation strategy that focuses on resiliency and preparing for the impacts of climate change.

STRATEGIC INVESTMENTS

$18.3 million was invested in 2016-17 towards achieving this action area. This investment supports the delivery of carbon pricing, methane reduction, carbon competitiveness incentives and the oil sands emissions cap. It is estimated that this investment supported approximately 310 jobs and will result in a range of 41 to 67 Mt of cumulative emission reductions by 2020.



PROGRESS SUMMARY

The following suite of measures, indicators and information helps monitor progress towards achieving strengthened climate leadership policy and legislation.

Performance Measures/Indicators	Baseline (2015)	Result (2016)	Target/ Desired Result	6-Year Trend	Status
1. Incent and Enable Emissions Reductions					
1.1 Priced Greenhouse Gas Emissions *(% of priced provincial CO_2 equivalent emissions)*	45	45*	70 (2018)	▲	●
1.2 Schedule of Carbon Price over Time	Table 1.2 Carbon Price Over Time				
1.3 Complementary Climate Change Legislation	Table 1.3 Complementary Climate Change Legislation				
2. Reduce Greenhouse Gas Emissions while Maintaining Competitiveness					
2.1 Commercial and Residential Greenhouse Gas Emissions (*Mt of CO_2 equivalent emissions from carbon-priced sectors excluding large industry and exempted sectors*)	54.5	Available April 2018	Decreasing trend	▲ (5 year)	TBD
2.2 Large Industry Emissions *(Mt of CO_2 equivalent emissions from oil and gas, electricity and heavy industry sectors)*	195.8	Available April 2018	Decreasing trend	▲ (5 year)	TBD
2.3 Methane Emissions Reductions *(% of methane emission reductions achieved by Alberta upstream oil and gas sector as compared to 2014 levels)* (in development)	TBD	TBD	45 (2025)	TBD	TBD
2.4 Oil Sands Emissions (*Mt of annual CO_2 equivalent emissions as outlined under the Oil Sands Emissions Limit Act*) (in development)	TBD	TBD	< 100	TBD	TBD
3. Ensure Collaborative Approach					
3.1 Alberta's Participation in Pan-Canadian Framework on Clean Growth and Climate Change	3.1 Narrative Results				
3.2 Climate Change Regulatory Compliance Rate *(% of regulatees that meet compliance requirements - common metric across all climate regulations)* (in development)	TBD	TBD	TBD	TBD	TBD

* Estimated result due to lag in data availability, actual result available April, 2018.

▲ Positive upward trend ▼ Positive downward trend ▲ Negative upward trend ▼ Negative downward trend

● Projected to meet or surpass target ● Projected to be near target ● Projected to be off target – Steady trend

PROGRESS DETAIL

1.1 PRICED GREENHOUSE GAS EMISSIONS

Description

Priced Greenhouse Gas Emissions measures progress toward pricing a broader range of provincial GHG emissions through legislation and regulations. It compares, as a percentage, the tonnes of provincial CO_2 equivalent emissions that are covered by a carbon price to the total tonnes of provincial CO_2 equivalent emissions.

Priced emissions include economy-wide emissions from the combustion of transportation and heating fuels (excluding certain fuels such as marked gas and diesel used on farms), as well as priced emissions of large industrial facilities (those emitting over 100,000 tonnes per year). For economy-wide priced emissions, total carbon levy revenue from combustion fuel pricing is divided by the carbon levy price per tonne.

Total tonnes of provincial CO_2 equivalent emissions includes emissions from agriculture, energy, industrial processes, solvent and other product use and waste source categories, but excludes those from biomass combustion, land use, land-use change and forestry. Data are from the Government of Canada's National Inventory Report, Greenhouse Gas Sources and Sinks in Canada 1990-2015 Part 3.

Importance

A price on carbon provides a market-based incentive for families, businesses and communities to lower their emissions. Carbon pricing systems are broadly understood to be effective and efficient means of reducing emissions. Pricing coverage is important as it reflects the breadth of the incentive and reductions that will be pursued. Incenting behavior changes through a carbon price ultimately contributes toward achieving reduced GHG emissions in Alberta. Environmental and ecosystem health and integrity are impacted by GHG emissions, as they are major contributors to climate change.

Target/Desired Result

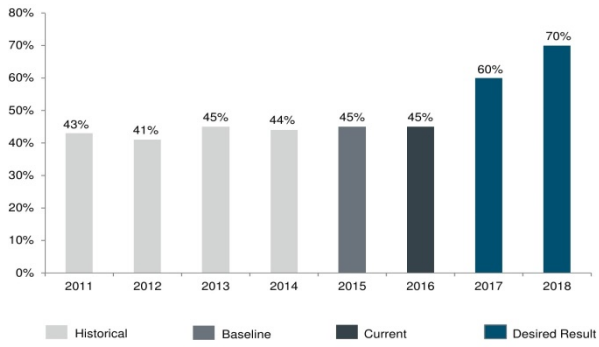
60 per cent by 2017 and 70 per cent by 2018.

Progress

Results from 2011 through 2016 indicate that Alberta has applied a carbon price to approximately 45 per cent of its total emissions.

This reflects results from the Specified Gas Emitters Regulation (SGER), which has implemented a price on emissions from large industrial emitters since 2007. The desired results of 60 per cent for 2017 and 70 per cent for 2018 reflect the carbon levy implemented on January 1, 2017, which broadens the carbon price to include emissions from the combustion of transportation and heating fuels. The approach to pricing of large industrial emitters will transition from a facility-specific one under SGER to an output- or product-based approach in 2018. This new framework sends a stronger emissions reduction signal to new and existing facilities and ensures Alberta and our industries thrive in a carbon competitive global market.

Figure PL 1.1: Priced Greenhouse Gas Emissions (% of priced provincial CO_2 equivalent emissions)



2016 result is estimated as there is a two-year lag in data from Environment and Climate Change Canada.

Data sources: Environment and Climate Change Canada - National Inventory Report 1990-2015: Greenhouse Gas Sources and Sinks in Canada; Alberta Treasury Board and Finance - Carbon Levy Data – ; Alberta Environment and Parks - Large Final Emitters data

The 2017 desired result is slightly lower than 2018, as 2018 introduces carbon pricing to industrial process emissions for industry.

1.2 CARBON PRICE OVER TIME

A carbon price is the amount charged for emitting one tonne of carbon dioxide into the atmosphere. Alberta has had a price on large industrial emissions since 2007. The CLP broadened this to an economy-wide price in 2017, as it is considered the most market-friendly and cost-effective way to reduce GHG emissions that cause climate change.

Table PL 1.2 Alberta's Carbon Price over Time illustrates how the incentive to reduce greenhouse gas emissions has broadened and increased over time.

Table PL 1.2: Alberta's Carbon Price over Time

Year	Regulation	Price (per tonne of CO_2 equivalent)	Applied to
2007	Specified Gas Emitters Regulation	$15	Larger final emitters
2016	Specified Gas Emitters Regulation	$20	Large final emitters
2017	Specified Gas Emitters Regulation	$30	Large final emitters
	Carbon Levy	$20	Economy-wide (excluding large final emitters)
2018 to 2020	Carbon Competitiveness Incentive Regulation	$30	Larger final emitters
	Carbon Levy	$30*	Economy-wide (excluding large final emitters)

* The price beyond 2020 will depend on the impact of the federal government's Pan-Canadian Framework on Clean Growth and Climate Change, which refers to a nationwide carbon price of $40 in 2021 and $50 in 2022.

1.3 COMPLEMENTARY CLIMATE CHANGE LEGISLATION

The CLP has an extensive suite of initiatives and policy that requires legislation in order to ensure that the initiatives can be implemented. For example, the CLP includes a target to increase renewable electricity sources to 30 per cent. One of the initiatives to achieve this target is to expand community and small-scale generation, which requires legislative changes. Table PL 1.3 identifies the statutes and regulations put in place to support the CLP in 2016 and early 2017.

Table PL 1.3: Complementary Climate Change Legislation

Statute/Regulation	What it Enables	Implementation Date
Climate Leadership Act and Climate Leadership Regulation	Carbon levy and approved exemptions, rebates, and refunds.	January 1, 2017
Alberta Personal Income Tax Act (Amendment)	The Alberta Climate Leadership Adjustment Rebates for lower and middle-income Albertans.	January 1, 2017
Alberta Corporate Tax Act (Amendment)	Small business corporate income tax rate reduction.	January 1, 2017
Micro-generation Regulation (Amendment)	Micro-generation up to 5 MW and Site Aggregation.	December 14, 2016
Energy Efficiency Alberta Act	New organization to support energy efficiency, energy conservation, micro-generation, and small-scale energy systems through education, outreach programs, and the development of an energy efficiency services industry.	October 27, 2016
Oil Sands Emissions Limit Act	Limit oil sands emissions to a maximum of 100 Mt in any year with provisions for cogeneration and new upgrading capacity.	December 14, 2016
Renewable Electricity Act and amendments to: • *Alberta Utilities Act* • *Electric Utilities Act* • *Environmental Protection and Enhancement Act* • *Hydro and Electric Energy Act*	• Renewable electricity target of 30 per cent of electricity from renewable energy sources by 2030. • Renewable Electricity Program.	March 31, 2017
Specified Gas Emitters Regulation (Amendment)	Option for facilities facing high carbon costs and vulnerability to competitive market conditions to “opt-in” to the Regulation (and no longer be subject to the carbon levy) in 2017.	March 30, 2017

In addition to the legislation that has already been implemented to support the CLP (Table PL 1.3), a number of other legislative initiatives are underway:

Carbon Competitiveness Incentives (CCIs) – Develop a regulation to transition from the existing facility-based approach in the Specified Gas Emitters Regulation to an output- or product-based approach that rewards facilities with best-in-sector performance, encourages innovation, and maintains industry competitiveness in a low-carbon global economy.

Methane Reduction – Develop and enhance regulatory standards for leak detection and repair, monitoring and reporting of methane emissions and requirements for new and existing facilities. This is necessary in order to implement government's commitment to reduce methane emissions from the oil and gas sector by 45 per cent from 2014 levels by 2025.

Coal Transition – Enshrine in law the government's commitment to phase out emissions from coal-fired electricity generation by 2030 and strengthen the commitments government and coal companies made in the Off-Coal Agreements.

Small-Scale Community Generation and Distributed and Renewable Generation – Develop a new regulation to enable forms of distributed alternative and renewable generation to encourage growth in small-scale community generation.

Oil Sands Emissions Limit – Develop a regulation to implement the 100 Mt oil sands limit with provisions for cogeneration and new upgrading capacity. The Oil Sands Advisory Group's advice to government on implementation of the limit was released to the public on June 16, 2017 and is being considered in the development of policy and regulation.

2.1 COMMERCIAL AND RESIDENTIAL GREENHOUSE GASES

Description

Commercial and Residential Greenhouse Gas Emissions measures the total megatonnes of CO_2 equivalent emissions from those sectors which use transportation and heating fuels and therefore pay the carbon levy. The measure excludes large industrial sector emissions and those sectors that are excluded from the carbon levy such as agriculture. It subtracts emissions from the large industry sector and exempted sectors from Alberta's total GHG emissions. Data are from the Government of Canada's National Inventory Report, Greenhouse Gas Sources and Sinks in Canada 1990-2015 Part 3. 2016 results are not available until April 2018 as there is a two-year reporting delay.

Importance

The CLP broadens and increases the financial incentive to reduce greenhouse gas emissions. In 2017 the carbon price was expanded beyond large industrial facilities through the application of the carbon levy on the combustion of transportation and heating fuels. Commercial and Residential Greenhouse Gas Emissions helps monitor whether the financial incentive to change behavior in these sectors is achieving its intended effect.

Target/Desired Result

Decreasing trend.

Progress

Although 2015 results in Figure PL 2.1 show a decrease of 3 Mt from 2014, likely due to the economic downturn, there is an increasing trend over five years. Emissions are expected to decrease more consistently beginning in 2017 as these sectors respond to the carbon price. When factoring in economic growth within the sectors included in this indicator, results are generally consistent over the five-year period. Figure PL 2.1.1 illustrates the emissions intensity of the residential and commercial sectors. The emissions intensity divides the emissions in CO_2 equivalent tonnes by gross domestic product (calculated in real price to adjust for inflation) for these sectors.

Figure PL 2.1: Commercial and Residential Greenhouse Gas Emissions (Megatonnes of CO_2 equivalent emissions from carbon-priced sectors excluding large industry and exempted sectors)

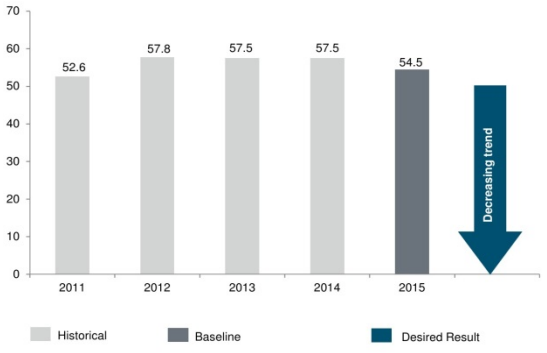
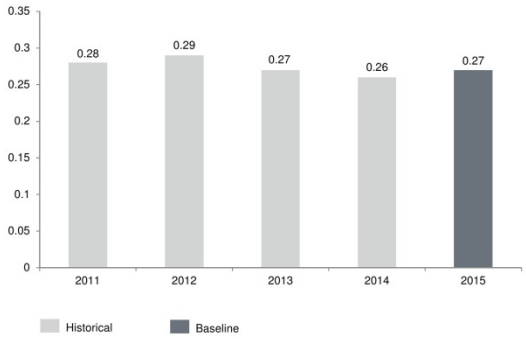


Figure PL 2.1.1: Commercial and Residential Greenhouse Gas Emissions Intensity (tonnes CO_2 equivalent/$1000)



Data sources: Environment and Climate Change Canada - National Inventory Report 1990-2015: Greenhouse Gas Sources and Sinks in Canada; Statistics Canada CANSIM Table 379-0030

2.2 LARGE INDUSTRY EMISSIONS

Description

Large Industry Emissions measures the total tonnes of CO_2 equivalent emissions from the oil and gas, electricity and heavy industry sectors, proportionally Alberta's highest emitting sectors. The heavy industry sector includes mining, pulp and paper, chemicals and fertilizers. Data are from the Government of Canada's National Inventory Report, Greenhouse Gas Sources and Sinks in Canada 1990-2015 Part 3. Data for 2016 are not available until April 2018 as there is a two-year reporting delay.

Importance

This indicator illustrates the trend in the amount of GHG released into the atmosphere in Alberta by Alberta's most emissions-intensive industries. Ultimately efforts to reduce emissions from these sectors have the most significant impact on Alberta's overall emissions. Tracking this indicator helps to determine how the industrial emissions pathway is being altered as a result of CLP policy and legislation, and in particular, the pricing of carbon from large industrial emitters.

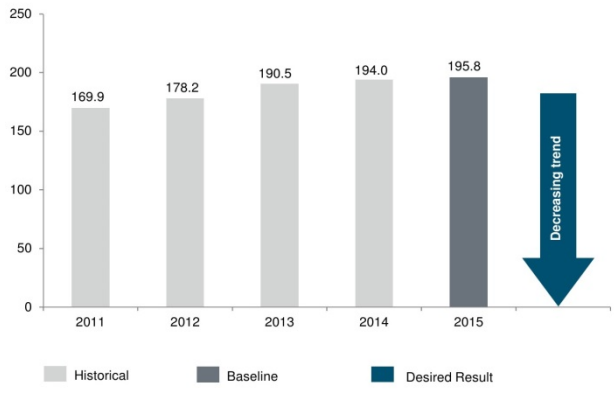
Target/Desired Result

Decreasing trend.

Progress

Results for 2015 show an increase in emissions of 1.8 Mt of CO_2 equivalents from 2014 results, reported at 195.8 Mt of CO_2 equivalents (Figure PL 2.2). The five-year trend for this indicator continues to reflect a general increase in emissions; however the pace of emissions growth decreased from 2013 to 2015 as compared to 2011 through 2013.

Figure PL 2.2: Large Industry Emissions (Megatonnes of CO_2 equivalent emissions from oil and gas, electricity and heavy industry sectors)



Data source: Environment and Climate Change Canada - National Inventory Report 1990-2015: Greenhouse Gas Sources and Sinks in Canada

It is likely that the economic slowdown in Alberta impacted this result and is not a result of the CLP, the impacts of which will not begin to be realized until the 2016 reporting year at the earliest. Changes in these sectors to less emissions-intensive processes, such as clean technology, will not be apparent in this indicator as emissions may increase as a result of production increases. For this reason, drilldown information on the emissions-intensity of these sectors is provided on Figures PL 2.2.1 through 2.2.3.

Figure PL 2.2.1: Oil and Gas Emissions Intensity (tonne/$1000)

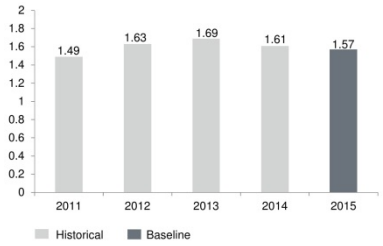


Figure PL 2.2.2: Electricity Emissions Intensity (tonne/$1000)

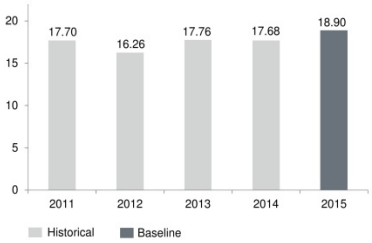
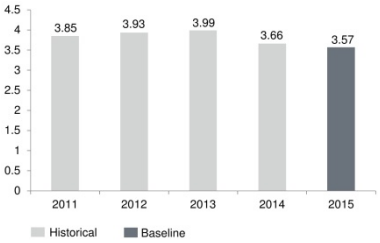


Figure PL 2.2.3: Heavy Industry Emissions Intensity (tonne/$1000)



Data source: Environment and Climate Change Canada - National Inventory Report 1990-2015: Greenhouse Gas Sources and Sinks in Canada; Statistics Canada CANSIM Table 379-0030

2.3 METHANE EMISSIONS REDUCTIONS

Measure/Methodology in Development

Alberta is targeting a 45 per cent reduction in methane emissions from upstream oil and gas operations (excluding oil sands mining) by 2025 from 2014 levels. This is one of the key strategies identified under the CLP as a cost-effective means to achieve significant GHG emissions reductions.

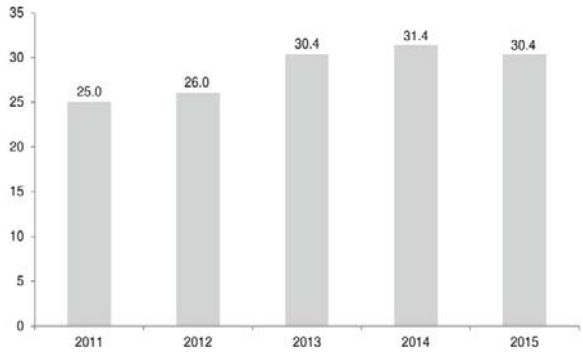
Methane is one of the most potent of the greenhouse gases, with a climate change impact 25 times greater than carbon dioxide over a 100-year period. In Alberta, the oil and gas industry is the largest source of methane emissions, accounting for over 70 per cent of provincial methane emissions and 25 per cent of all emissions from the upstream oil and gas sector.

Methane Emissions Reductions will measure the per cent reductions of methane emissions from Alberta's upstream oil and gas industry (excluding oil sands mining) as compared to the 2014 baseline year. One of the challenges in addressing methane emissions is the lack of quality data and information. A necessary step to achieve the methane target is the implementation of a new reporting system along with proposed requirements for metering, emissions testing and emissions factors to allow for better quality methane emissions data. A more effective monitoring system will also better inform approaches to capture emissions.

Data for Methane Emissions Reductions will be provided by the new measurement, monitoring and reporting system that will capture methane emission data from upstream oil and gas facilities. Figure PL 2.3 provides methane emission estimates from Canada's National Inventory Report on Greenhouse Gases and Sinks. As Alberta develops and implements methodologies to monitor and report on emissions, these numbers will change and therefore will not be the source data used for this measure during execution.

Based on the latest data that have yet to be published in the National Inventory Report, Alberta may have more opportunity to reduce methane emissions to meet its target.

Figure PL 2.3: Methane Emissions from Upstream Oil & Gas industry (Megatonnes of CO_2 equivalent)



Data source: Environment and Climate Change Canada - National Inventory Report 1990-2015: Greenhouse Gas Sources and Sinks in Canada

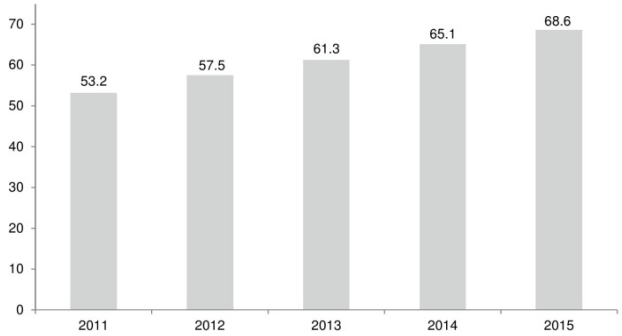
Alberta will achieve the 2025 target using the following approaches:

- Applying new emission reduction requirements on Alberta facilities.
- Improving measurement and reporting of methane emissions.
- Developing new leak detection and repair requirements.
- Phasing in the implementation of regulatory measures on new and existing facilities between 2018 and 2023, with a mandatory regulatory review by 2022 based on actual data collected during the first few years, to ensure optimization and efficiency in any regulatory measures going forward.

2.4 OIL SANDS EMISSIONS

The oil sands sector accounts for roughly one-quarter of Alberta's annual emissions, emitting 68.6 Mt in 2015. Passed in December 2016, the *Oil Sands Emissions Limit Act* established a first-ever cap on oil sands emissions in response to joint recommendations by Canadian and international leaders in Alberta's oil sands industry and environmental organizations. A cap increases the incentive to drive technological progress while ensuring Alberta's operators have the necessary time to develop and implement new technology to reduce the carbon output per barrel, helping drive reductions in Alberta's overall emissions trajectory.

Figure PL 2.4: Oil Sands Emissions (Megatonnes of CO_2 equivalent)



Data source: Environment and Climate Change Canada - National Inventory Report 1990-2015: Greenhouse Gas Sources and Sinks in Canada

Oil Sands Emissions will track Alberta's emissions under the 100 Mt cap. The methodology for this measure will be developed according to policy decisions under the *Oil Sands Emissions Limit Act.*

In 2016, the government established an Oil Sands Advisory Group composed of members from industry, regulators, environmental organizations, Indigenous, Métis and non-Indigenous communities to provide recommendations on the implementation of the 100 Mt limit, which will inform policy recommendations.

Figure PL 2.4 provides oil sands emissions from Environment and Climate Change Canada's 1990-2015 National Inventory Report. Results for the Oil Sands Emissions measure will differ based on policy decisions regarding any exclusions under the *Oil Sands Emissions Limit Act*.

3.1 ALBERTA'S PARTICIPATION IN PAN-CANADIAN FRAMEWORK ON CLEAN GROWTH AND CLIMATE CHANGE

In 2016, the Government of Canada ratified its commitments in the Paris Agreement, which features a commitment to reduce emissions by 30 per cent from 2005 levels by 2030. Accordingly, Canada must reduce its emissions from approximately 730 Mt in 2015 to 523 Mt in a little over a decade.

The federal government has announced that provinces must enact an emissions reduction plan, or Ottawa will impose a federal carbon tax in 2018 on provinces without. Fortunately, the CLP ensures our unique economy will be covered by an Alberta-first strategy designed specifically for us.

In 2016, Alberta actively engaged with the federal government to ensure our voice was heard in the development of the national strategy on climate change. The Pan-Canadian Framework on Clean Growth and Climate Change, released in early 2017, identifies the CLP as a key accomplishment in reaching national emission goals, and also notes some of Alberta's specific actions to reduce GHGs.

Alberta will continue to advocate for its own unique circumstances and is committed to continued climate leadership on the national as well as international stage.

3.2 CLIMATE CHANGE REGULATORY COMPLIANCE RATE

As CLP legislation and regulations are implemented, it's critical stakeholders understand and comply with them. A common measure of regulatory compliance across all climate regulations is in development as regulations are defined and implemented.

Methodology and interim results will be reported in future CLP Progress Reports.

POLICY RESULTS

Policy Initiatives	2016-17 Milestones/Results	2017-18 Actions/Next Steps
Carbon Pricing	Implemented legislation to enable carbon levy, carbon levy rebates to low- and middle-income households and small business tax cuts (2017). • *Climate Leadership Act*. • Climate Leadership Regulation. • *Alberta Personal Income Tax Act* (Amendment). • *Alberta Corporate Tax Act* (Amendment).	Ongoing monitoring and assessment of policy and legislation impact.
Oil Sands Emission Cap	Established Oil Sands Advisory Group (2016) with members from industry, environmental nongovernmental organizations, Indigenous and non-Indigenous communities. Legislated oil sands emissions limit of a maximum 100 Mt in any year (2016). Received Oil Sands Advisory Group Recommendations Report on implementation of the oil sands emissions limit (2017).	Expert workshops and plenary sessions to identify and develop policy options reflective of recommendations.
Carbon Competitiveness Incentive system (CCIs)	Held three rounds of technical workshops with industry groups on the design and thresholds for new CCI approach (2016, 2017). Engaged third-party technical experts and completed competitiveness assessment in collaboration with stakeholders and Alberta Climate Change Office staff (2016, 2017). Developed policy options for implementation of CCIs (2017). Engagement on CCI benchmarks.	Replacing Specified Gas Emitters Regulation with Carbon Competitiveness Incentive Regulation on January 1, 2018. Implementation of Carbon Competitiveness Incentive approach.
Methane Reduction	Announced methane emissions target of 45 per cent reduction in the upstream oil and gas sector by 2025 from 2014 levels (2016). Alberta Energy Regulator established Methane Reduction Oversight Committee (MROC) to develop recommendations and options to inform cost-effective regulations for new and existing facilities in the oil and gas sector. Members are from government, environmental nongovernment organizations, industry and technology groups (2016). MROC created two technical committees to provide technical support.	Engage stakeholders on draft requirements through AER's public feedback process. Revise and release directives by summer of 2018 for phase in between 2019 and 2023. Ongoing work on methane strategy including enhancements to existing directives, studies in partnership with other

	Initiated Methane Early Action Information Scan including engagement with stakeholders to identify barriers and opportunities for early action on oil and gas methane reductions (2017 and ongoing). Drafted methane reduction Alberta Energy Regulator directives. Discussed with MROC and technical committees for comment and advice (2017). Draft requirements finalized and being discussed within the AER and Alberta Energy. Released Quantification Program for Greenhouse Gas Emissions Reductions from Pneumatic Devices (offset protocol for replacement of high-bleed pneumatic instruments with low- or no-bleed devices) in January 2017. Engaging with Environment and Climate Change Canada on federal methane direction to inform and advocate Alberta's regulatory development (2016, 2017 and ongoing).	organizations, economic modelling to assess regulatory impacts, updates to the ST60B report and work in the following areas: • Fugitive emissions. • Measurement, monitoring and reporting. • Regulations for existing facilities. • Regulations for new facilities. Ongoing engagement with Environment and Climate Change Canada.
Micro and Community Energy Generation	Implemented Micro-generation Amendment Regulation (2016) increasing the size limit to 5 megawatts, allowing servicing to adjacent sites and providing for more flexibility and greater variety of configurations. Launched Community Distribution Generation White Paper (2017). Initiated online survey for stakeholders on Community Distributed Generation (2017).	Community Generation Regulation to be developed and implemented by 2018. (Micro- and small-scale generation programs are reported on in Increased Renewable Energy Section).

RENEWABLE ENERGY

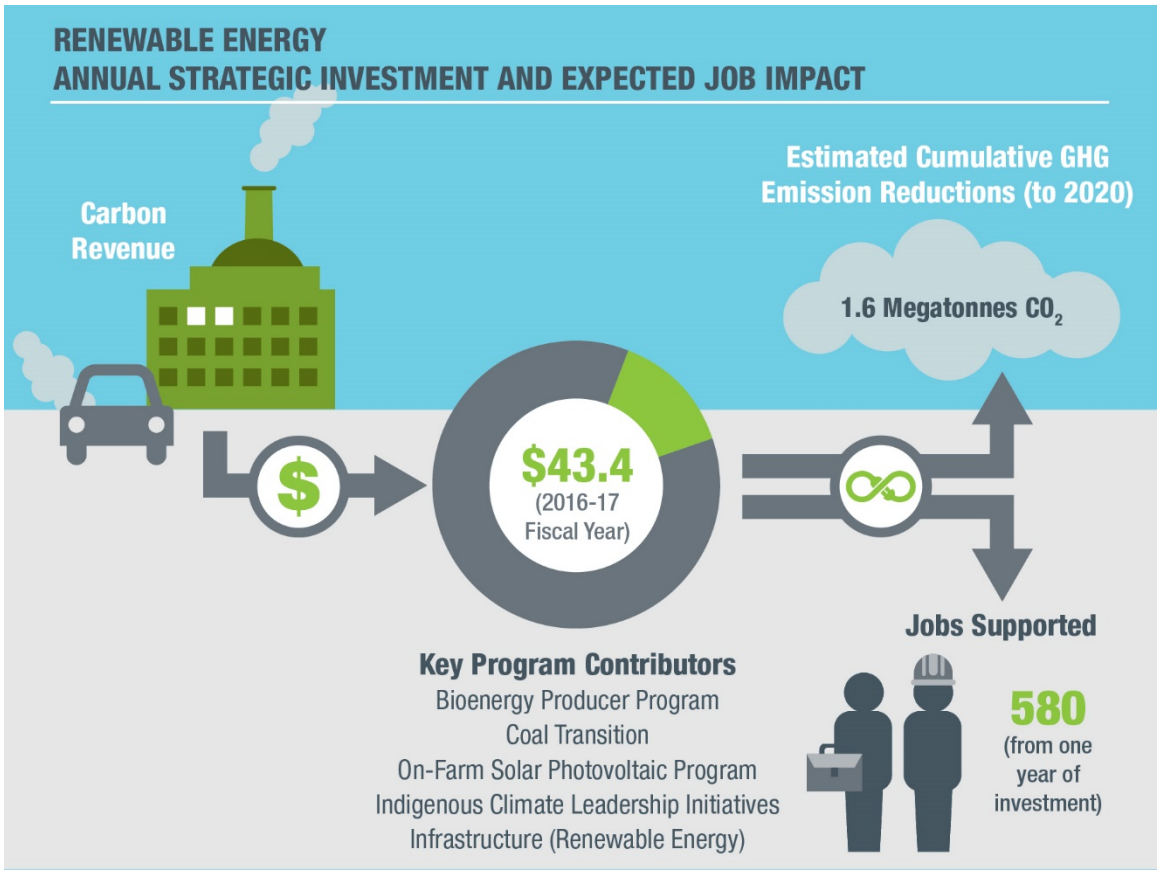
OBJECTIVES AND TARGETS

Alberta is committed to increasing renewable energy sources to transition to a cleaner electricity system that eliminates pollution from coal-fired electricity generation. Renewable energy programs, policies and investments are designed to achieve the following results:

- **Transition electricity** to a cleaner electricity system.
  - *Target:* **30 per cent electricity generated from renewable sources by 2030.**
- **Reduce greenhouse gas emissions** through electricity transition.
  - *Target:* **Zero emissions from coal-fired electricity generation by 2030.**
- Maintain **a reliable, cost-effective electricity system.**

STRATEGIC INVESTMENTS

$43.4 million was invested in 2016-17 towards achieving this action area. This investment supports the delivery of renewable energy programs, including the Bioenergy Producer Program, Alberta Indigenous Solar Program, infrastructure projects and the coal phase-out. It is estimated that this investment supported approximately 580 jobs and will cut 1.6 Mt of cumulative GHG emissions by 2020.



PROGRESS SUMMARY

The following suite of measures, indicators and information helps monitor progress towards generating more renewable energy.

Performance Measures/Indicators	Baseline (2015)	Result (2016)	Target/ Desired Result	6 Year Trend	Status
1. Electricity Transition					
1.1 Renewable Electricity Generation *(% of electricity generated from renewable sources)*	9.45*	9.97*	30 (2030)	▲	●
2. Greenhouse Gas Emissions					
2.1 Coal-fired Generation Emissions (*Megatonnes of CO_2 equivalent emissions*)	40.74	39.84	0 (2030)	▲	●**
2.2 Alberta's Electricity System Emissions Intensity (*grams of CO_2 equivalent emissions per kilowatt hour of electricity generated*)	790***	Available 2018	Decreasing trend	▲ (5 year)	TBD
2.3 Renewable Energy Emissions Reductions (*Mt of CO_2 equivalent emissions reduced or avoided by transitioning to renewable energy sources*)	9.10	9.89	Increasing trend	▲	●
3. Reliable, Affordable Electricity System					
3.1 Power Generation Margin (*difference in peak demand and firm generating capacity expressed as a percentage*)	31	29	Above 7	▲	●
3.2 Monthly Regulated Rate Option Electricity Rate (*cents per kilowatt hour*)	5.7	3.9	Max 6.8	▼	●

* A more comprehensive methodology is being developed and subsequent reported results will change accordingly.

** Based on signed and legally binding agreements in place.

*** Environment Canada has identified this as a preliminary result.

▲ Positive upward trend ▼ Positive downward trend ▲ Negative upward trend ▼ Negative downward trend

● Projected to meet or surpass target ● Projected to be near target ● Projected to be off target – Steady trend

PROGRESS DETAIL

1.1 RENEWABLE ELECTRICITY GENERATION

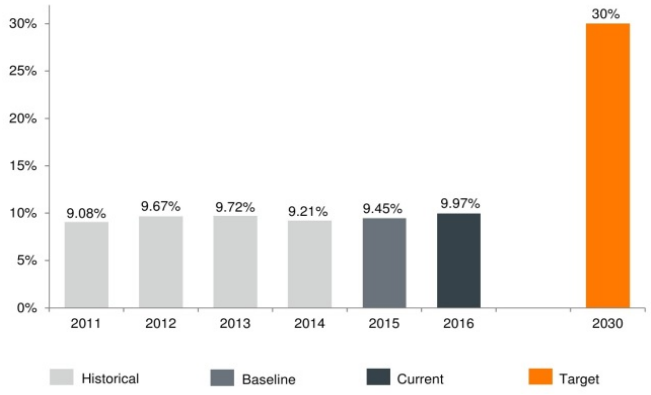
Description

Renewable Electricity Generation measures the total megawatt hours of electricity generated from renewable sources as a percentage of the total electricity generated over one-year. Renewable sources include hydro, wind, biogas, biomass, solar and geothermal. The share of renewable energy is determined from statistics from generators and distributors connected to the grid and which have a capacity of 500 kilowatts or more. These are collected and reported annually by the Alberta Utilities Commission (AUC). There is currently no methodology to collect data from systems that operate independently from the electricity grid. A more comprehensive methodology is being developed to capture off-grid generation and include facilities connected to the grid but using renewable sources for internal use (e.g. forestry facilities' internal use of biomass). The Alberta Electric System Operator reports on the number of micro-generation sites and installed capacity on a quarterly basis.

Importance

Moving to more renewable energy and natural gas and away from coal-fired electricity source is q key pillar of the CLP. Total life cycle GHG emissions from solar or wind power are about 20 times lower than coal-fired electricity (National Renewable Energy Laboratory, January 2013). Increasing renewable electricity generation lets Alberta reduce its GHG emissions.

Figure RE 1.1: Renewable Electricity Generation (% of electricity generated from renewable sources)



Data source: Alberta Utilities Commission

Target/Desired Result

30 per cent by 2030.

Progress

The 2011 through 2016 results show an upward trend in renewable electricity generation. This increase is primarily due to a steady increase in generation from wind sources, which increased by over 50 per cent from 2011 to 2016. It is expected that the pace of the upward trend will accelerate with the introduction of CLP initiatives

.

Table RE 1.1 provides a breakdown of the measure results by each of the renewable sources.

Table RE 1.1: Percent of Electricity Generated from Renewable Sources

Resource	2011	2012	2013	2014	2015	2016
Wind	3.42%	3.62%	4.09%	4.32%	4.67%	5.24%
Hydro	2.88%	3.18%	2.67%	2.32%	2.14%	2.11%
Biogas/Biomass	2.79%	2.86%	2.96%	2.57%	2.63%	2.62%
Total	9.08%	9.67%	9.72%	9.21%	9.45%	9.97%

Renewable electricity generation results are expected to noticeably increase as key CLP initiatives roll out. In 2016-17, the Bioenergy Producer Program supported 1 million MWh of stable renewable electricity production within its first application period. As well, the first competition in Renewable Electricity Program will see companies bidding to provide up to 400 MW of renewable electricity which could be added to the grid by 2020. Energy Efficiency Alberta's Residential and Commercial Solar Program has pre-approved support to install 3.7 MW of solar electricity capacity as of August 31, 2017. Indigenous communities will see more opportunities to participate in the Alberta Indigenous Solar Program in late 2017, representing an expansion of the program pilot that supported the installation of 1.2 MW in 14 Indigenous communities.

2.1 COAL-FIRED GENERATION EMISSIONS

Description

Coal-Fired Generation Emissions measures the total GHG emissions in megatonnes of CO_2 equivalent from coal-fired power plants. It is a sum of the facility-measured direct, indirect, and industrial process emissions reported under Annual Specified Gas Emitters Regulation Compliance Reports.

Importance

Ending coal pollution is a key pillar of Alberta's CLP. Alberta produces more coal pollution than the rest of Canada combined. Coal plants are also a major source of air pollution, releasing pollutants like cadmium, lead, mercury, nitrogen oxides and sulphur dioxide. Eliminating emissions from coal-fired plants and transitioning to cleaner sources of energy will help protect Albertans' environment and health.

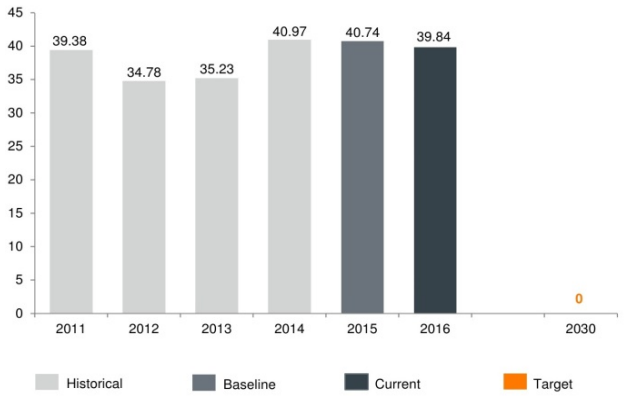
Target/Desired Result

Zero by 2030.

Progress

2016 saw two per cent lower emissions, the second straight year of decline. The trajectory towards zero emissions from coal-fired generation is not known as companies have until 2030 to decide when they will phase out coal. These coal generators are legally obliged to meet that deadline. Alberta Energy is working with the Government of Canada to develop enabling regulations for Alberta coal generators.

Figure RE 2.1: Coal-fired Generation Emissions (Megatonnes of CO_2 equivalent)



Data source: Annual SGER Compliance Reports (2011-2016)

2.2 ALBERTA'S ELECTRICITY SYSTEM EMISSIONS INTENSITY

Description

Alberta's Electricity System Emissions Intensity measures the total GHG emitted in grams of CO_2 equivalent for every kilowatt hour of electricity generated. Data are from Environment Canada's 2017 National Inventory Report, annexed data sets in Table A13-10 Electricity Generation and GHG Emission Details for Alberta[1]. GHG emissions include those directly related to electricity generation as well as on-site combustion of fuel. Results from 2016 results will not be available until 2018 due to an 18-month lag in data

Importance

One focus of the CLP is reducing emissions from the electricity sector. This indicator shows how GHG emissions are changing with a shift in the level of production. Although it does not show the total amount of GHGs released, the intensity will ideally decrease by enough to also reduce the system's total GHG emissions – even with increases in production.

Target/Desired Result

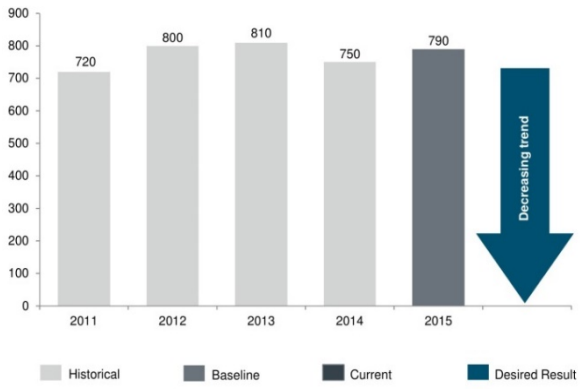
Decreasing trend.

[1] Statistics Canada defines "electricity system" emissions, generation and intensity as those facilities classified under North American Industry Classification System code 22111- Electric Power Generation.

Progress

Current emissions are down from their peak in 2013, and as CLP policies are implemented, emissions from coal-fired generation are phased out, renewable energy sources increase and cleaner technology is implemented, the trend will flatten and eventually decrease.

Figure RE 2.2: Alberta's Electricity System Emissions Intensity (grams of CO2 equivalent emissions per kilowatt hour of electricity generated)



Data source: Statistics Canada Report on Energy Supply-Demand in Canada: Catalogue No. 57-003-XIB; Environment Canada Data – National, Provincial and Territorial Greenhouse Gas Emission Tables: A-13 Electricity

2.3 RENEWABLE ENERGY EMISSIONS REDUCTIONS

Description

Renewable Energy Emissions Reductions measures the total GHG emissions reduced or avoided in megatonnes of CO_2 equivalent due to transitioning to renewable energy sources. It is the total of annual megawatt hours of electricity generation from hydro, wind, biogas and biomass resources multiplied by the emissions factor 0.59 tonnes/MWh. Generation data are from the Alberta Utilities Commission and the emissions factor, applicable to projects displacing grid-electricity with renewable energy, is extracted from the Carbon Offset Emissions Factor Handbook, Version1, ESRD Climate Change 2015, No.1. The calculation assumes the electricity generated by renewable resources would have otherwise been supplied through a mix of coal and natural gas-fired generation.

Importance

The intent of moving to 30 per cent of electricity generation from renewable sources is to reduce GHG emissions. This indicator tracks the impact of increasing renewable energy sources on Alberta's GHG emissions reductions.

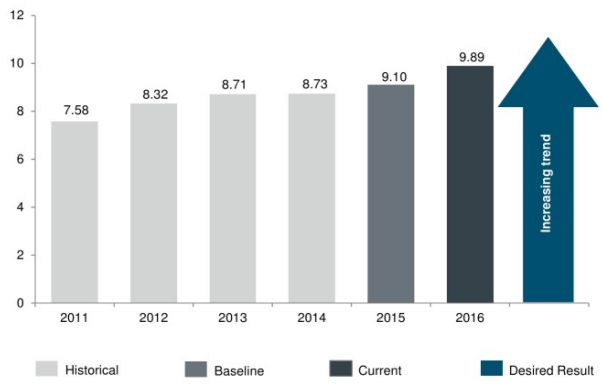
Target/Desired Result

Increasing trend.

Progress

Over the past five years, indicator results have been on an upward trajectory. These results are correlated to higher renewable electricity generation. As renewable energy sources increase, so will GHG emissions reductions. Continued emissions reductions are expected as programs to increase renewables generation are implemented.

Figure RE 2.3: Renewable Energy Emissions Reductions (Megatonnes of CO_2 equivalent reduced by transitioning to renewable energy sources)



Data source: Alberta Utilities Commission, Carbon Offset Emissions Factor Handbook

3.1 POWER GENERATION MARGIN

Description

Power Generation Margin measures the percentage megawatt difference between firm generating capacity and peak demand. The intent of the indicator is to show a sufficient difference, or margin, between firm electricity generating capacity and peak demand. In other words, ensuring demand will not exceed maximum supply. Peak demand is defined as the highest recorded hourly system demand in megawatts from October 1, 2016 to March 31, 2017 as recorded by the Alberta Electric System Operator. Electricity from all wind sources and those sources of hydro capacity that are not dispatchable (able to be turned on or off) on a consistent basis, are not counted as firm generating capacity and are excluded from the total installed generating capacity. The data source is the Alberta Utilities Commission and the Alberta Electric System Operator.

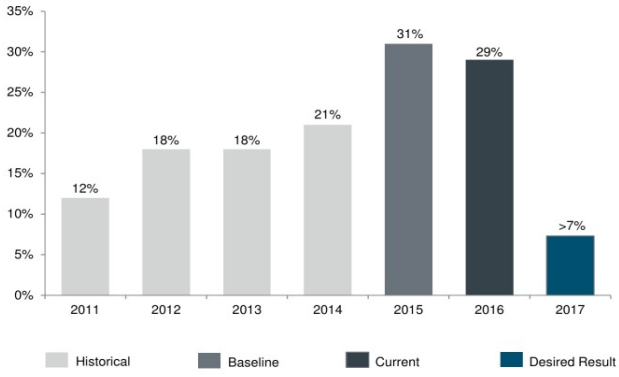
Importance

Alberta's economic prosperity and high standard of living rely on reliable and plentiful electricity. Maintaining a reliable and resilient electricity system, as measured by the power margin, is a key objective of every electric system around the world. As Alberta transitions its electricity system away from coal to renewable sources, it will be important to ensure that it remains reliable.

Target/Desired Result

Maintain a minimum seven per cent margin over peak demand. This desired result is a specific reliability requirement of the Western Electricity Coordinating Council, the regional entity responsible for coordinating system reliability in many Canadian, American and Mexican jurisdictions.

Figure RE 3.1: Power Generation Margin (the difference in peak demand and firm generating capacity expressed as a percentage)



Data source: Alberta Utilities Commission; Alberta Electric System Operator (AESO)

Progress

In 2016, Power Generation Margin surpassed the desired result, with a margin of 29 per cent. Softer growth in demand for electricity in 2016, due to lower economic growth, was the main external factor to achieving a high margin. The efforts of Energy Efficiency Alberta to reduce demand growth over time will also contribute to maintaining an adequate power generation margin in the province.

3.2 MONTHLY REGULATED RATE OPTION ELECTRICITY RATE

Description

Monthly Regulated Rate Option Electricity Rate measures monthly residential electricity costs in cents per kilowatt hour averaged across four electricity providers over the calendar year. Electricity providers are Direct Energy Regulated Services, ENMAX Energy, EPCOR Energy Services Edmonton and EPCOR Energy Services Fortis Alberta territory. The data source is the Alberta Utilities Commission's (AUC) Utility Sector Rates and Tariffs. 2016 results are preliminary, as the calculation assumes that approved values provided in AUC Monthly Energy Charges Approval documents dated March 2016 - July 2016 were the actual rate charged to consumers by electricity providers.

Importance

As Alberta transitions its electricity system to cleaner sources, it is important to monitor the impact on consumer electricity rates. The Government is committed to ensuring stable and affordable prices and has applied a price ceiling to protect consumers from price fluctuations from June 1, 2017 to May 31, 2021, during the shift from an energy-only market to a capacity power market. The price ceiling applies to those with a regulated rate option (RRO). If the RRO is below 6.8 cents, people pay the lower rate. If the RRO is higher, then carbon levy revenue will fund the difference

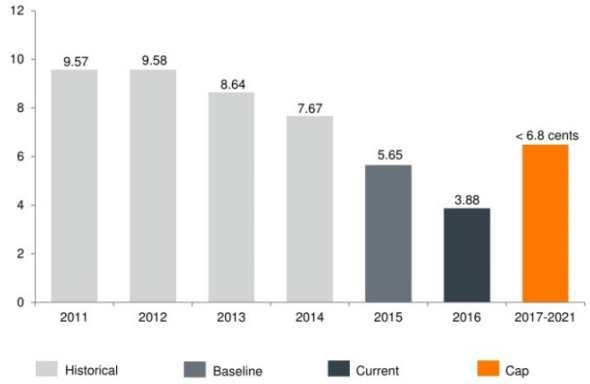
Target/Desired Result

Maximum of 6.8 cents for 2017 through 2021.

Progress

Albertan's Monthly Regulated Rate Option Electricity Rate has been on a downward trend over the last five years. Results from 2011 through 2014 are higher than the pricing cap that took effect in June 2017. In 2016, the rate decreased by 1.77 cents per kilowatt hour. The Government has not forecasted higher electricity rates but has applied a cap to ensure stable consumer prices as Alberta's electricity system transitions. Efforts of Energy Efficiency Alberta will also help reduce overall electricity costs for consumers over the long term.

Figure RE 3.2: Monthly Regulated Rate Option Electricity Rate (cents per kilowatt hour)



Data source: Alberta Utilities Commission monthly data – Residential Electricity Costs

RENEWABLE ENERGY PROGRAM CONTRIBUTORS

FUNDED IN 2016-17		
Primary	Supporting	Additional
• Coal Transition • Bioenergy Producer Program • Alberta Indigenous Solar Program • On-Farm Solar Photovoltaic Program • Renewable Energy Infrastructure Projects	• Residential and Commercial Solar Program • Emissions Reduction Alberta Grant	• Alberta Municipal Solar Program • Solar Technology Initiative

ANNOUNCED IN 2017-18 Preliminary 2017 – Includes programs announced as of August 31, 2017
Primary
• Renewable Electricity Program • Regulated Rate Option Price Ceiling • Alberta Indigenous Green Energy Development Program

PROGRAM HIGHLIGHTS

892,225 Watts — Solar electricity capacity installed on farms

14 — Indigenous community projects received Solar Program grants

1.1 Megatonnes — GHG emission reductions through Bioenergy Producer Program

400 MW — Renewable energy capacity issued for competitive auction (2017-18)

68 — Schools participating in Solar Technology Initiative

PROGRAM RESULTS

2016-17 Primary Contributors

Programs/Projects	2016-17		2017-18 Actions/Next Steps	Estimated Cumulative GHG Reductions to 2020 (tonnes)
	Funding	Milestones		
Coal Transition This program supports companies adversely impacted by phasing out coal by 2030 that would be able to operate coal-fired facilties beyond 2030 were a phase-out not in place.	$1.1M	Coal facilitator appointed to lead discussions with coal-fired electricity generation owners. Coal transition payments negotiated with companies under Off-Coal Agreements.	First annual payments made to coal generators who have facilities with an end-of-life date beyond 2030 (Power CP, TransAlta, ATCO). Continue payments to coal generators who have facilities with end-of-life past 2030 as per stipulated in Off-Coal Agreements.	*Enables GHG emission reductions through electricity transition.*
Bioenergy Producer Program This program supports bioenergy producers in an effort to develop a sustainable bioenergy sector and capitalize on contributions towards a lower carbon economy.	$39.7M	Program Period 1 completed[2] • 30 Grant Agreements signed. • Supported production of 1M MWh of stable renewable electricity. • Supported production of 65M litres of biofuels. • Supported production of over 4M gigajoules of avoided natural gas consumption for process heat. • 1.1M tonnes of GHG emissions reductions.	Program Period 2 (April 1 – September 30, 2017) grant documents to be filed and reviewed and payments to be processed.	1.6M
Alberta Indigenous Solar Program (AISP) This program provides grants to Indigenous communities or organizations to install solar photovoltaic systems on	$ 1.8M	Program criteria developed (Fall 2016). Pilot program launched (October 2016): • Pilot program was oversubscribed. • Grants executed to 14 community projects. • Solar photovoltaic systems	Modifications to the pilot program criteria (May 2017). Funding approved for 2017-18 program (June 2017). Re-launch of the program (TBD 2017).	*Available in 2018.*

[2] Estimated numbers for the Bioenergy Producers Program Period 1 as final payments are being processed.

facilities, contributing to the target of 30 per cent renewable electricity by 2030.		installed.		
On-Farm Solar Photovoltaic Program This program provides grants towards installing solar photovoltaic (systems on farms, enabling producers to conserve fossil fuels and reduce carbon emissions, reducing the environmental footprint of Alberta's agriculture industry.	$416K[3]	• 50 grants paid to producers for incorporating solar panels into their operations. • 892,225 watts of solar electricity capacity installed. • 690 tonnes of GHG reductions per year.	Further approval and support to applicants to the program.	2,760
Renewable Energy Infrastructure Projects Individual projects provide opportunities to green public infrastructure by generating clean electricity, contributing to the target of 30 per cent renewable electricity by 2030.	$240K	Farm Stewardship Centre Showcase Solar Photovoltaic: • Contracted engineering design of grid-tied solar photovoltaic installation. • Installation of consumption and production metering with visitor display. • Retrofit lighting with energy efficiency LEDs. Miquelon Lake Provincial Park Centre Rooftop Solar System: • Contracted assessment and design. • Installation of solar photovoltaic panels and interpretative signage on visitor centre. High River Resource Centre: • Installation of solar photovoltaic panels on the roof of the Spitzee Crossing Provincial Building.	Heart Lake Firenet Master Site/Lookout Site Solar Project: • Approval of site plan from Lac La Biche Forestry district. • Site preparation and procurement of material and equipment. • Installation of solar panel grid. Martin Primary Fire Base Prime Power Solar Project: • Approval of site plan from Fort McMurray. Forestry district • Site preparation and procurement of material and equipment. • Installation of solar photovoltaic	172

[3] In 2016-17 the Government of Alberta spent $5.9M on the Farm Energy Program – Growing Forward to support cleaner agriculture activities in Alberta. This funding included four sub-programs: On-Farm Solar Photovoltaic Program, On-Farm Energy Management Program, Irrigation Efficiency Program, and the Accelerating Agriculture Innovation Program, Stream C.

			panel grid. More projects to be included post funding approval.	

2016-17 Supporting Contributors

Programs/Projects	2016-17		2017-18 Actions/Next Steps	Estimated Cumulative GHG Reductions to 2020 (tonnes)
	Funding	Milestones		
Residential and Commercial Solar Program This Energy Efficiency Alberta program supports the purchase and installation of solar photovoltaic systems on residential and commercial buildings.	Energy Efficiency Alberta provides programs that increase energy efficiency and generate renewable energy. Information on this program is provided as part of the primary program contributors in Energy Efficiency.			
Emissions Reduction Alberta Grant Emissions Reduction Alberta supports innovation as well as the research and development of clean technology.	Emissions Reduction Alberta supports projects that address many market demands, including those arising from the transition from coal-fired to renewable electricity generation. Information on this program is provided as part of the primary program contributors in Supply & Use of Clean Technology and Transit.			

2016-17 Additional Contributors

Programs/Projects	2016-17		2017-18 Actions/Next Steps	Estimated Cumulative GHG Reductions to 2020 (tonnes)
	Funding	Milestones		
Alberta Municipal Solar Program This program provides rebates to municipalities that install solar photovoltaic systems on municipal facilities or land and complete public education programs on their project.	$2.3M	Program launch through the Municipal Climate Change Action Centre (February 2016): • 36 projects supported representing 23 municipalities. • Projects combined save municipalities $481,000 on power bills annually.	Continued delivery of the AMSP to new participants and support of existing projects through the Municipal Climate Change Action Centre.	20,400[4]
Solar Technology Initiative This program provides additional project grants to install solar photovoltaic systems on approved school capital projects.	$9M	68 schools participating in the program: • Solar photovoltaic systems are being installed. • Education and engagement plans developed for students.	Continued evaluation of the impact of the installations with the Government, expanding the initiative over time.	21,200

[4] Greenhouse gas (GHG) emission reductions represent conservative estimates from the Municipal Climate Change Action Centre (MCCAC) that range from 5,100 to 8,400 tonnes of reductions annually from installed systems.

Programs Announced in 2017-18 (preliminary as of August 31, 2017).

Programs/Projects	2017-18 Actions/Next Steps	Estimated Cumulative GHG Reductions to 2020 (tonnes)
Renewable Electricity Program Alberta will add 5,000 MW of renewable energy capacity by 2030 through the Renewable Electricity Program, run by the Alberta Electric System Operator (AESO).	Alberta Electric System Operator (AESO) engaged with stakeholders on proposed commercial terms of the program. Renewable Electricity Program 1: • Competitive auction issued for up to 400 MW of renewable capacity, which could power up to 170,000 homes. • 80 submissions received. • 29 qualified for the Request for Proposal stage. • Selection of successful proponents and execution of the Renewable Electricity Support Agreement (Dec 2017).	724,000[5]
Regulated Rate Option Pricing Ceiling To ensure Albertans are not adversely impacted through the transition of the electricity system, the RRO rate cap ensures electricity costs are capped at 6.8 cents/kWh for the vast majority of customers including homes, businesses and farms until 2021.	Legislation passed that enables the implementation of the price ceiling. Alberta Energy to lead administration of the rate cap and payments required. Consideration to alternative RRO arrangement that may align with customer expectation as best limit cost to government.	*Enables GHG emission reductions through support of electricity transition.*
Alberta Indigenous Green Energy Development Program This program provides grants to Indigenous communities to develop commercial-scale renewable energy projects. The grants will allow Indigenous communities and	Program launch (June 2017). Approval of eligible projects and installation of commercial-scale renewable electricity generation systems. Ongoing support to Indigenous Communities.	*To be determined based on projects approved for funding.*

[5] Estimated greenhouse gas (GHG) emissions reductions are calculated with a capacity factor of 0.35 and emissions intensity of 0.59 tonnes/MwH.

organizations to acquire an ownership stake in Alberta's rapidly expanding renewable energy sector, as well as contribute to the target of 30 per cent renewable by 2030.		

ENERGY EFFICIENCY

OBJECTIVES AND TARGETS

Alberta is committed to the efficient use of its energy resources. Increased energy efficiency focuses on:

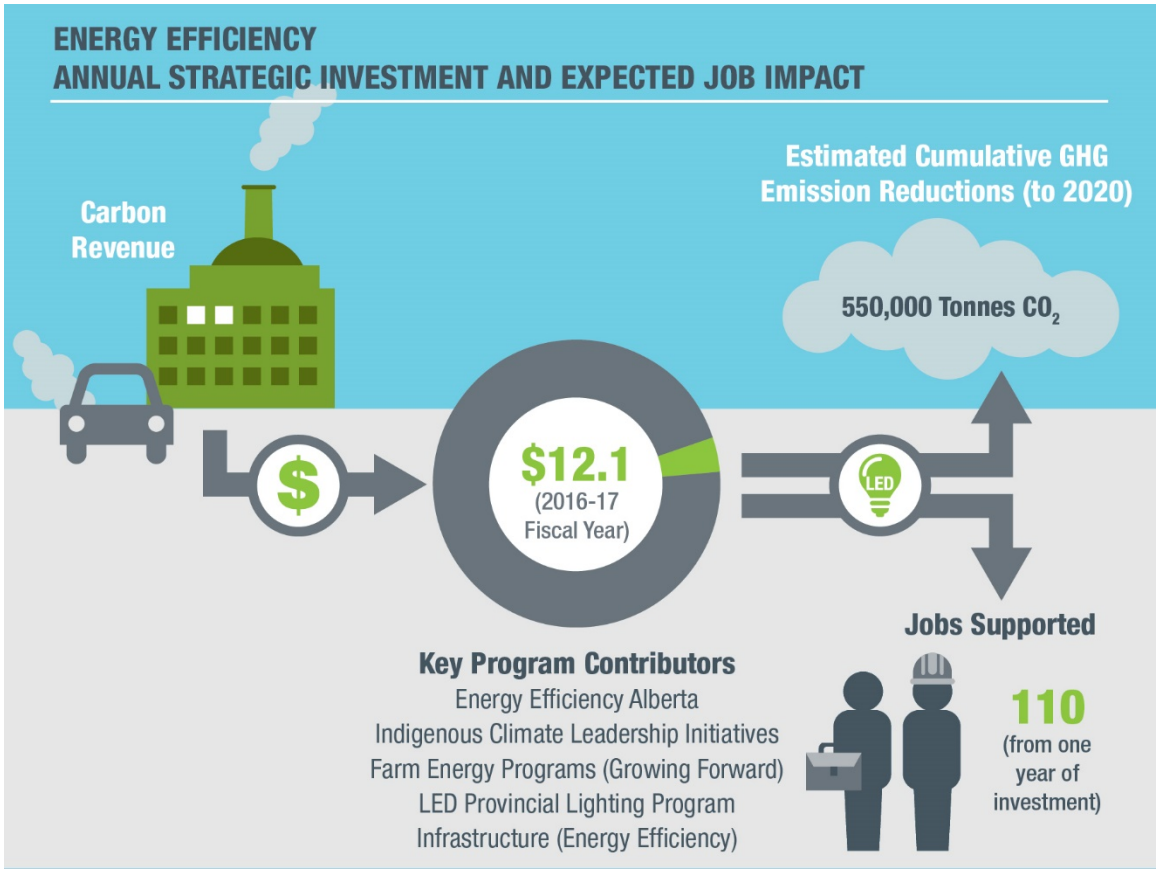
- **Improving the energy efficiency of homes, businesses, institutions, industries, and communities.**
- **Reducing/avoiding GHG emissions through decreased energy consumption and increased energy conservation.**
- **Improving Albertans' quality of life through costs savings and increased comfort and efficiencies.**
- **Fostering growth of an energy efficiency industry.**

The primary means of to achieving these objectives is the new agency, Energy Efficiency Alberta (EEA).

Note: Energy Efficiency Alberta also has a mandate to promote, design and deliver programs and activities to support the development of micro-generation and small-scale energy systems. Outcomes and results related to micro- and small-scale energy systems are included under the Renewable Energy action area.

STRATEGIC INVESTMENTS

$12.1 million was invested in 2016-17 towards achieving this action area. This investment supported the launch of EEA and its initial programs, as well as energy efficiency infrastructure and Indigenous programs. It is estimated that this investment supported about 110 jobs and will result in 550,000 tonnes of cumulative emissions reductions by 2020.



PROGRESS SUMMARY

The new Energy Efficiency Alberta agency was established in January 2017. As measures and indicators in the Progress Summary primarily report on EEA programs, results for 2016, prior to the existence of EEA, are zero; 2017 results are preliminary and include EEA program results through August 31. The Agency is in the process of further developing its measurement, reporting and evaluation systems. Future annual progress reports will reflect these developments.

Note: 2.1 GHG Emissions Reduction through Energy Savings includes both EEA programs and additional energy efficiency programs running before the launch of the Agency.

Performance Measures/Indicators	Result (2016)	Preliminary 2017 Result (to Aug 31, 2017)	Target/ Desired Result (2018)	Trend*	Status
1. Energy Savings					
1.1 Annual Energy Savings *(gigajoules of energy savings achieved by EEA programs)*	0	555,031	1,293,160	●	NA
1.2 Lifetime Energy Savings *(gigajoules of energy savings for all EEA programs over the life of the measures)*	0	TBD	TBD	TBD	TBD
1.3 Water Savings *(total cubic meters of water savings from EEA residential programs)*	0	547,700	Increasing trend	●	NA
2. Greenhouse Gas Emissions					
2.1 GHG Emission Reductions through Energy Savings *(total emission reductions in CO2 equivalent tonnes achieved from EEA and additional energy efficiency programs)*	NA	141,567	TBD	NA	NA
3. Improved Quality of Life					
3.1 Cost Savings/Effectiveness *(in development)*	0	TBD	TBD	TBD	TBD
3.2 Consumer Product and Service Rebates/Incentives *(total value of EEA associated rebates/incentives accessed by Albertans in millions of $)*	0	15.9	Increasing trend	●	NA
3.3 Value of Saved Energy to Electrical Grid *(in development)*	0	TBD	TBD	TBD	TBD
3.4 Customer Satisfaction Index *(Average ranking of customer satisfaction with Residential No-Charge Energy Savings Program)*	NA	4.66	> 4	NA	NA
4. Market Transformation – Growth of Alberta's Energy Efficiency Industry**					

4.1 Outreach and Awareness Proxy *(total # of household registrants and participants in EEA programs)*	0	182,432	Increasing trend	●	NA

* Year over year based on preliminary 2017 results.

**Additional market transformation indicators will be developed and reported on as the Agency further develops its performance management systems.

▲ Positive upward trend ▼ Positive downward trend ▲ Negative upward trend ▼ Negative downward trend

● Projected to meet or surpass target ● Projected to be near target ● Projected to be off target – Steady trend

PROGRESS DETAIL

1.1 ANNUAL ENERGY SAVINGS

Description

Annual Energy Savings measures the total gross savings in energy consumption that directly result from Energy Efficiency Alberta programs. Reported preliminary results are for the period March 28 to August 31, 2017. These savings, expressed in gigajoules, represent energy that would have been used were it not for the energy efficiency program. Savings are calculated based on deemed savings (product-specific, installation rates, net-to-gross ratio and line-loss factor or home heating system efficiency for each program and then aggregated for total results. This includes interactive effects (how a measure may relate to other measures); and take-back effects (instances where more energy efficiency could result in more energy use, for example leaving a low-efficiency light bulb on for longer). Data are from the Residential No-Charge Energy Savings Program, the Residential Retail Products Program, the Business, Non-Profit and Institutional Energy Savings Program, and the Residential and Commercial Solar Program progress reports as of August 31, 2017.

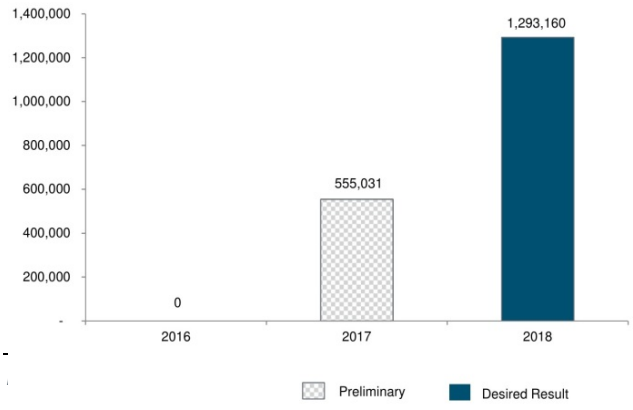
Importance

Consuming less energy is one of the most effective ways to lower our carbon footprint, and the Energy Efficiency Alberta was established to help. Using less energy reduces GHG emissions and helps Albertans save on energy costs.

Target/Desired Result

1,293,160 gigajoules saved by 2018.

Figure EE 1.1: Annual Energy Savings (achieved by EEA programs, in gigajoules as of Aug 31, 2017)



Progress

Based on the recommendations of the Alberta Energy Efficiency Advisory Panel report "Getting It Right - A More Energy Efficient Alberta", four EEA programs were launched in 2017:

- Residential No-Charge Energy Savings Program.
- Residential Retail Products Program including
  - Online Rebates
  - Instant Savings
  - Home Improvement Rebates
- Business, Non-Profit and Institutional Energy Savings Program.

- Residential and Commercial Solar Program.

The reported result includes energy savings achieved by these four programs. As these are preliminary and reflect only a partial year, the desired result it is expected to be achieved.

1.2 LIFETIME ENERGY SAVINGS

Lifetime Energy Savings measures expected energy savings over the life of all EEA programs. Methodology and data for lifetime energy savings will be provided and reported on in future CLP Progress Reports.

1.3 WATER SAVINGS

Description

Water Savings measures the total cubic metres of demand-side water that is saved as a result of the Residential No-Charge Energy Savings Program (RNCESP) for the period March 28 to August 31, 2017. Data are from RNCESP progress reports.

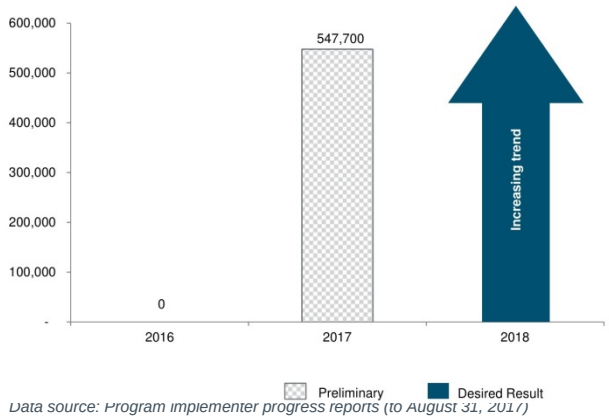
Importance

Reducing water consumption helps protect the environment and saves money. Water and energy are inherently linked on both the supply and demand side. On the supply side, a massive amount of water is needed for electricity generation; on the demand side, a massive amount of electricity is required to treat and deliver water to consumers. This means that any efficiency program that saves energy will most likely have direct or induced water savings as well and *vice versa*.

Target/Desired Result

Increasing trend.

Figure EE 1.3: Water Savings (total cubic meters of water savings from EEA residential program as of Aug 31, 2017)



Data source: Program implementer progress reports (to August 31, 2017)

2.1 GHG EMISSION REDUCTIONS THROUGH ENERGY SAVINGS

Description

GHG Emission Reductions through Energy Savings measures emissions avoided due to energy savings from EEA and additional energy efficiency programs in tonnes of CO_2 equivalent between March 28 and August 31, 2017. The measure is calculated by applying a GHG emissions factor that varies depending on the fuel source. Since the agency has a provincial mandate, results from Taking Action to Manage Energy (TAME+ and TAME Express) grants for 2015-18, Irrigation Efficiency and On Farm Energy Management programs are also included.

Importance

Avoiding GHG emissions through energy savings is one of the most cost-effective ways to reduce our carbon footprint. Establishing Energy Efficiency Alberta is a significant achievement of the CLP, which is why it is important to monitor the impact of its programs on reducing GHG emissions.

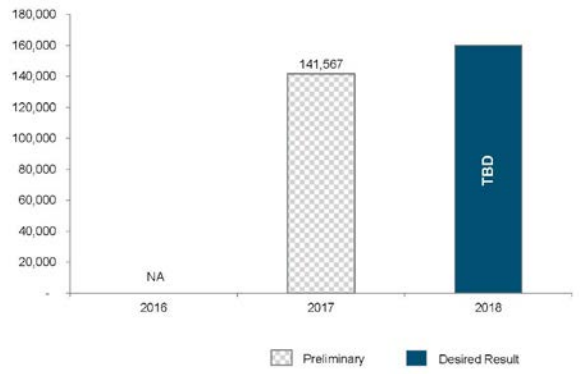
Target/Desired Result

TBD.

Progress

EEA and additional energy programs have saved more than 140,000 tonnes of GHG emissions through energy savings.

Figure EE 2.1: GHG Emission Reductions through Energy Savings (tonnes of CO_2 equivalent achieved as of Aug 31, 2017)



Data source: Program implementer progress reports (to August 31, 2017)

3.1 COST SAVINGS/EFFECTIVENESS

Cost Savings/Effectiveness refers to the costs and benefits of installing a given measure. This can either be from the perspective of the end consumer, the program itself, or the total costs and benefits to all parties. Methodology and data for cost savings will be provided and reported on in future CLP Progress Reports.

3.2 CONSUMER PRODUCT AND SERVICE REBATES/INCENTIVES

Description

Consumer Product and Service Rebates/Incentives measures the dollar value of rebates and discounts that Albertans received through EEA programs from March 28 to August 31, 2017. The measure is calculated from data reported by EEA's four current programs.

Importance

Rebates and discounts provided through energy efficiency programs help enable Albertans to upgrade their electrical equipment, fixtures and insulation systems and encourage them to shift to renewable sources of energy. These incentives complement government efforts to reduce GHG emissions, as well as provide Albertans some immediate economic benefits through reduction in their energy bills and related maintenance costs.

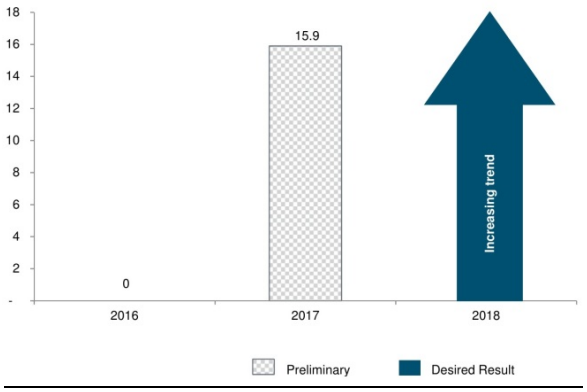
Target/Desired Result

Increasing trend.

Progress

As of August 31, 2017 Alberta households have received $15.9 million in rebates through home improvements, online rebates, solar system installations and energy-efficient residential retrofits. Businesses and non-profit organizations have received $476,310 in rebates for high-efficiency products to improve energy efficiency.

Figure EE 3.2: Consumer Product and Service Rebates/Incentives (total value of EEA rebates/incentives accessed by Albertans in millions as of Aug 31, 2017)



Data source: Program implementer progress reports (to August 31, 2017.)

3.3 VALUE OF SAVED ENERGY TO ELECTRICAL GRID

The definition, methodology and data for value of saved energy to electrical grid will be provided and reported on in future CLP Progress Reports.

3.4 CUSTOMER SATISFACTION INDEX

Description

Customer Satisfaction Index measures Residential No-Charge Energy Savings Program participants' satisfaction. It is calculated by post-program participation surveys that ask about available information, registration process, quality of products/services, as well as the knowledge and conduct of staff involved. Respondents rank survey questions on a scale of 1 to 5, where 1 is not satisfied and 5 is extremely satisfied. Reported results are from the Residential No-Charge Energy Savings Program progress report as of August 31, 2017.

Importance

Energy Efficiency Alberta is committed to ensuring a positive customer experience for all program participants. Customer satisfaction encourages ongoing energy efficiency participation and behavior changes.

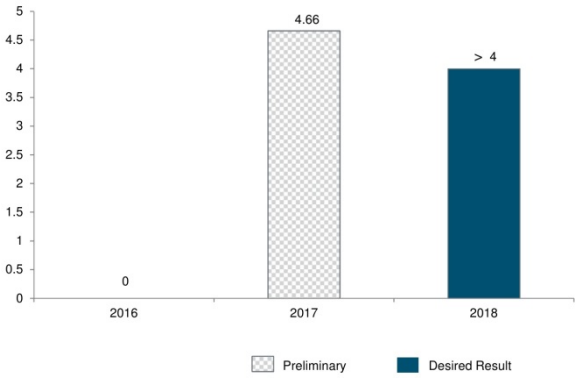
Target/Desired Result

Greater than four.

Progress

The Residential No-Charge Energy Savings Program has achieved a consumer satisfaction score of 4.66 out of 5, indicating that program participants are either satisfied or extremely satisfied with the program. Results for the Business, Non-Profit and Institutional Energy Savings Program will be included in the index and reported on in future CLP Progress Reports.

Figure EE 3.4: Customer Satisfaction Index (average ranking of customer satisfaction with Residential No-Charge Energy Savings Program as of Aug 31, 2017)



Data source: Program implementer progress reports (to August 31, 2017)

4.1 OUTREACH AND AWARENESS PROXY

Description

Outreach and Awareness Proxy measures the number of Albertans who have been engaged in pre-program consultations, as well as those who registered and/or participated in the four EEA programs as of August 31, 2017. Registration and participation are used as a proxy for awareness Results do not factor in the potential for households and registrants to participate in more than one program.

Importance

Increasing outreach and awareness of the available programs boosts participation in these programs and helps people use energy more efficiently. EEA residential programs allow Albertans to benefit from rebates and home improvement support, and access information on how individual energy conservation generates socio-economic and environmental benefits for individuals and the province as a whole.

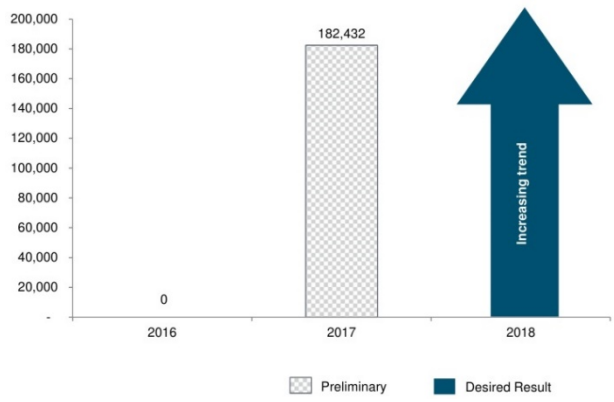
Target/Desired Result

Increasing trend.

Progress

Based on reported data as of August 31, 2017, Energy Efficiency Alberta's programs have reached 182,432 Albertans. Future programing will explore ways to target households that have not actively participated in programs to date.

Figure EE 4.1: Outreach and Awareness Proxy (total # of household registrants and participants in residential EEA programs as of Aug 31, 2017)



Data sources: Program implementer progress reports (to August 31, 2017)
Alberta climate change office internal analysis

ENERGY EFFICIENCY PROGRAM CONTRIBUTORS

FUNDED IN 2016-17

Primary	Additional
• Start Energy Efficiency Alberta • Residential No-Charge Energy Savings Program • Residential Retail Products Program • Alberta Indigenous Community Energy Program • On-Farm Energy Management Program • Irrigation Efficiency Program • Accelerating Agriculture Innovation Program • LED Provincial Highway Lighting Program • Energy Efficiency Infrastructure Projects	• Taking Action to Manage Energy Program • Taking Action to Manage Energy Express Pilot

ANNOUNCED IN 2017-18
Preliminary 2017 – Includes programs announced as of August 31, 2017

Primary
• Business, Non-Profit and Institution Energy Savings Program • Residential and Commercial Solar Program • Non-Profit Energy Efficiency Transition Program • Alberta Indigenous Climate Planning Program • Alberta Indigenous Energy Efficiency (Retrofit) Program

PROGRAM HIGHLIGHTS

4.3 Million
Energy efficiency products purchased through Instant Savings Program

211
Grants paid to Alberta farmers and ranchers to improve energy efficiency

555,031 GJ
Annual energy savings

3,728
Households participated in Residential Retail Products Program

502,534
Light bulbs installed through Residential No-Charge Energy Savings Program

PROGRAM RESULTS

2016-17 Primary Contributors

Programs/Projects	2016-17		2017-18 Actions/Next Steps	Estimated Cumulative GHG Reductions to 2020 (tonnes)
	Funding	Milestones		
Start Energy Efficiency Alberta Agency This program delivers activities required to establish Energy Efficiency Alberta including initial program delivery for:	$1.43M	Energy Efficiency Alberta established and programs developed.		487,300
Residential No-Charge Energy Savings Program (RNCESP) This Energy Efficiency Alberta program offers direct, no-charge installation of energy efficiency products in rural and urban houses, apartment & condominiums. Home owners and tenants are both eligible.		Residential No-Charge Energy Savings Program developed. Registration launched (February 2017). Program launched (March 2017).	Over 135,800 households have pre-registered. Installation of energy efficiency products in 17,526 Alberta households: • Changed 502,534 light bulbs. • 90,121 GJ of energy savings achieved. • 547,700 m^3 of water saving achieved. • 3,984 tonnes of GHG emissions reductions.	
Residential Retail Products Program This Energy Efficiency Alberta program offers point-of-sale rebates for the purchase of energy efficiency measures through participating retailers during four to six week spring and fall		Residential Retail Products Program developed.	Program launched (April 2017). Instant Savings Program Spring Campaign: • Albertans purchased 4.3 million energy efficient products from 526 participating retailers.	

campaigns. The program will also offer year-round rebates on selected measures that necessitate an immediate purchase (e.g. refrigerators, thermostats, clothes washers, etc.). It also offers rebates for Home Improvement measures installed.			• $14,063,837 rebates provided. • 422,807 GJ of energy savings. • 78,066 tonnes of GHG emissions reductions. Online Rebate Program: • 3,728 households participated. • $372,100 in rebates provided for high-efficiency thermostats and appliances. • 1,142 tonnes of GHG emissions reductions. Home Improvement Rebate Program: • 835 approved contractors in the program. • $984,715 in rebates provided for hot water heaters, insulation and windows. • 18,472 GJ of energy savings. • 1,745 tonnes of GHG emissions reductions.	
Alberta Indigenous Community Energy Program (AICEP) This program provides tools and support to help Indigenous communities understand how energy is used in buildings, as well as to conduct energy audits to identify opportunities to save energy and money.	$1M	Program criteria developed (Fall 2016). Pilot project launched (October 2016): • Pilot program was oversubscribed. • Grants executed to 11 community projects. • ASHRAE Level 2 building audits completed.	Modifications to the pilot program criteria (May 2017). Funding approved for 2017-18 program (June 2017). Re-launch of the program (TBD 2017).	*Available in 2018.*
On-Farm Energy	$4.2M[6]	211 grants to farmers and	Further approval and	20,470

[6] In 2016-17 the Government of Alberta spent $5.9M on the Farm Energy Program – Growing Forward to support cleaner agriculture activities in Alberta. This funding included four sub-programs: On-Farm Solar Photovoltaic Program, On-Farm Energy Management Program, Irrigation Efficiency Program, and the Accelerating Agriculture Innovation Program, Stream C.

Management Program The Growing Forward Farm Energy program shares the costs of investments that improve energy efficiency on farms, including the installation of on-farm sub-meters to make farmers better aware of their energy usage and how to manage it to improve their bottom line.		ranchers to purchase equipment to improve energy efficiency. 5,117 tonnes of GHG emission reductions.	support to program applicants.	
Irrigation Efficiency Program This Farm Energy (Growing Forward) program supports producers' investment in new or upgraded low-pressure centre pivot (LPCP) irrigation equipment for their operations, improving the energy efficiency and water use of farms.	$1M[6]	108 grants to farmers to upgrade irrigation equipment that increases the sustainability of water resources and reduce energy inputs. 1,300 tonnes of GHG emission reductions.	Further approval and support to program applicants.	5,200
Accelerating Agriculture Innovation Program This Farm Energy (Growing Forward) program supports late-stage activities on the innovation continuum of start-up/scale-up demonstration work and adoption of energy efficiency technologies for the agriculture sector.	$556K[6]	Stream C: • 27 grants paid to agri-processors to assist with retro-fitting their facilities and/or adopting new technologies and practices.	Further approval and support to program applicants.	30,000
LED Provincial Highway Lighting Program This program supports the upgrade of high-pressure sodium luminaires with LED luminaires	$1M	Pilot Program: • Approximately 600 luminaires replaced in Edmonton.	Phase 1: • Approximately 1,800 luminaires replaced in Edmonton. • Approximately 3,200 luminaires replaced in Calgary.	931

along the provincial highway system.			• Approximately 1, 000 luminaires replaced in Medicine Hat. Additional program phases to be developed.	
Energy Efficiency Infrastructure Projects Individual projects provide opportunities to green public infrastructure by reducing energy consumption and/or increasing energy efficiency, contributing to reducing emissions.	$2.76M	Mount Royal University Central Power Upgrades: • Replacement of 32-year-old heat exchangers and burners with high-efficiency technology. Central Region Energy Audit: • Pilot program contracted and completed an energy audit for the largest area of Alberta's park system. • List of recommended energy conservation initiatives compiled. Kananaskis Region Upgrades for Greenhouse Gas Reduction: • Pilot program contracted and completed an energy audit for the Kananaskis region park system. • List of recommended energy conservation initiatives compiled. Facility Energy Audits: • Contracted and completed the majority of energy audits of major sites in the community housing portfolio, including social housing and senior lodge buildings. • Recommended energy conservation initiatives identified. Lubicon Lake Band	Hospital LED Lighting: • Approval of hospital retrofitting program and schedule. • Installation of LED luminaires in hospitals. Hospital Rooftop Unit Logic Controller: • Upgrade existing rooftop ventilation with new technology that reduces energy use in hospitals. Hospital Utility Management Plan: • Develop a provincial utility management plan to provide a long-term strategy for hospitals to reduce energy consumption and emissions. Recommissioning Mechanical/Electrical Systems at Health Facilities: • Conduct energy audits of mechanical and electrical systems at health facilities to identify inefficiencies. Upgrade Variable Air Volume (VAV) Controller at Health Facilities: • Upgrade existing ventilation with new technology that	5,652 *Some projects enable GHG emission reductions by providing information on possible options for further investment.*

		Green Infrastructure Assessment: • Contracted and completed an energy audit and planning study to support the development of a state-of-the-art energy efficiency community for the Lubicon Lake Band. • List of recommended energy initiatives identified. Historical Building Grant Program: • Contracted and completed a planning study, including a working model to measure the impacts of historical building preservation and reuse on GHG emissions. LED Lighting Upgrade Program for Health Facilities: • This program was for the upgrading of existing T12 lamps and magnetic ballast with LED lamps and electronic lamps in health facilities. LED Lamp Replacement Program: • This program was to upgrade existing T8 lamps with LED lamps in health facilities.	reduced energy use in health facilities. More projects to be included post-funding approval.	

2016-17 Additional Contributors

Programs/Projects	2016-17		2017-18 Actions/Next Steps	Estimated Cumulative GHG Reductions to 2020 (tonnes)
	Funding	Milestones		
Taking Action to Manage Energy (TAME+) Program This program provides support to municipalities for custom energy upgrades to municipal facilities as recommended in detailed energy audits.	$2.73M	Custom energy efficiency upgrades (funded) as recommended by detailed energy assessments completed by applicant municipalities. Program delivery through Municipal Climate Change Action Centre: • $2.73M allocated to approved projects. • 45 projects approved in 25 municipalities. • 35,078 tonnes of GHG emission reductions. Program fully subscribed and closed to applicants as of October 2017.	Ongoing program work to include disbursement of rebates to projects as they are completed.	35,000
Taking Action to Manage Energy (TAME) Express Pilot Program This program offers quick access to financial incentives to municipalities to implement high-efficiency lighting retrofits, including indoor lighting, outdoor building and parking lot lighting, lighting controls and exit signs.	$360K	Funding for the implementation of high-efficiency lighting retrofits completed by municipalities. Program delivery through Municipal Climate Change Action Centre: • $360,000 allocated to approved projects. • 56 projects approved in 29 municipalities. • 14,281 tonnes of GHG emission reductions. Program fully subscribed and closed to applicants as of October 2017.	Ongoing program work to include disbursement of rebates to projects as they are completed.	14,280

Programs Announced in 2017-18 (preliminary as of August 31, 2017)

Programs/Projects	2017-18 Actions/Next Steps	Estimated Cumulative GHG Reductions to 2020 (tonnes)
Business, Non-Profit and Institutional (BNI) Energy Savings Program This Energy Efficiency Alberta program offers rebates to business, non-profits and institutions for choosing high-efficiency products, including lighting, cooling and hot water systems.	Program launched (May 2017). 1,047 businesses, 115 non-profits and 48 institutions have submitted applications to the program. As of August 31, 2017: • $2M in allocated program funding. • 2,940 GJ of energy savings. • 523 tonnes of GHG emissions reductions.	195,000 (lifetime)
Residential and Commercial Solar Program This Energy Efficiency Alberta program supports the purchase and installation of solar photovoltaic systems on residential and commercial buildings, contributing towards 30 per cent renewable electricity generation by 2030.	Updates to legislation and regulations to support micro- and small-scale generation capacity. Program launched (June 2017). Processed 301 pre-approved applications with potential installed capacity of 3.7 MW: • 280 residential applicants. • 20 commercial applicants. • 1 non-profit applicant. • $2.47M in allocated program funding. • 332 tonnes of GHG emissions reductions. Approval and processing of applications over two-year program.	500,000 (lifetime)
Non-Profit Energy Efficiency Transition (NEET) Program This Energy Efficiency Alberta program provides support to help non-profit and volunteer groups audit their facilities and determine how efficient their current lighting, heating, cooling and hot water	Program launch through the Municipal Climate Change Action Centre (January 2017). Program was initially oversubscribed based on expressions of interest: • 157 active applications. • 116 applications screened. • 50 audits approved. Completion of audits approved in 2016-17. Approval of additional funding for NEET under Energy Efficiency Alberta (June 2017).	*Enables GHG emission reductions by providing information on possible options for further investment.*

systems are.		
Alberta Indigenous Climate Planning Program (AICPP) This program provides grants to Indigenous communities to establish and understand energy conservation opportunities and set priorities to improve energy efficiency, reduce greenhouse gas emissions and support local development. Through this program, Indigenous communities will develop community energy plans and projects for the community.	Program launch (June 2017). Approval of eligible projects and completion of community energy plans and opportunity assessments. Ongoing support to Indigenous communities.	*Enables GHG emission reductions by providing information on possible options for further investment.*
Alberta Indigenous Energy Efficiency (Retrofit) Program (AIEEP) This program provides grants to improve the energy efficiency of Indigenous community and Indigenous organization-owned buildings, contributing to reduced GHG emissions. Grants can be applied to retrofit existing building or to upgrade the energy efficiency of new buildings.	Program launch (June 2017). Approval of eligible projects and installation of energy efficiency building upgrades. Ongoing support to Indigenous communities.	*To be determined based on projects approved for funding.*

CLEAN TECHNOLOGY AND TRANSIT

OBJECTIVES AND TARGETS

Clean Technology and Transit focuses on businesses and industry through Innovation and Clean Technology initiatives; and the general public through public transit initiatives. Innovation and Clean Technology and Transit programs, policies and investments are designed to achieve the following:

Innovation and Clean Technology:

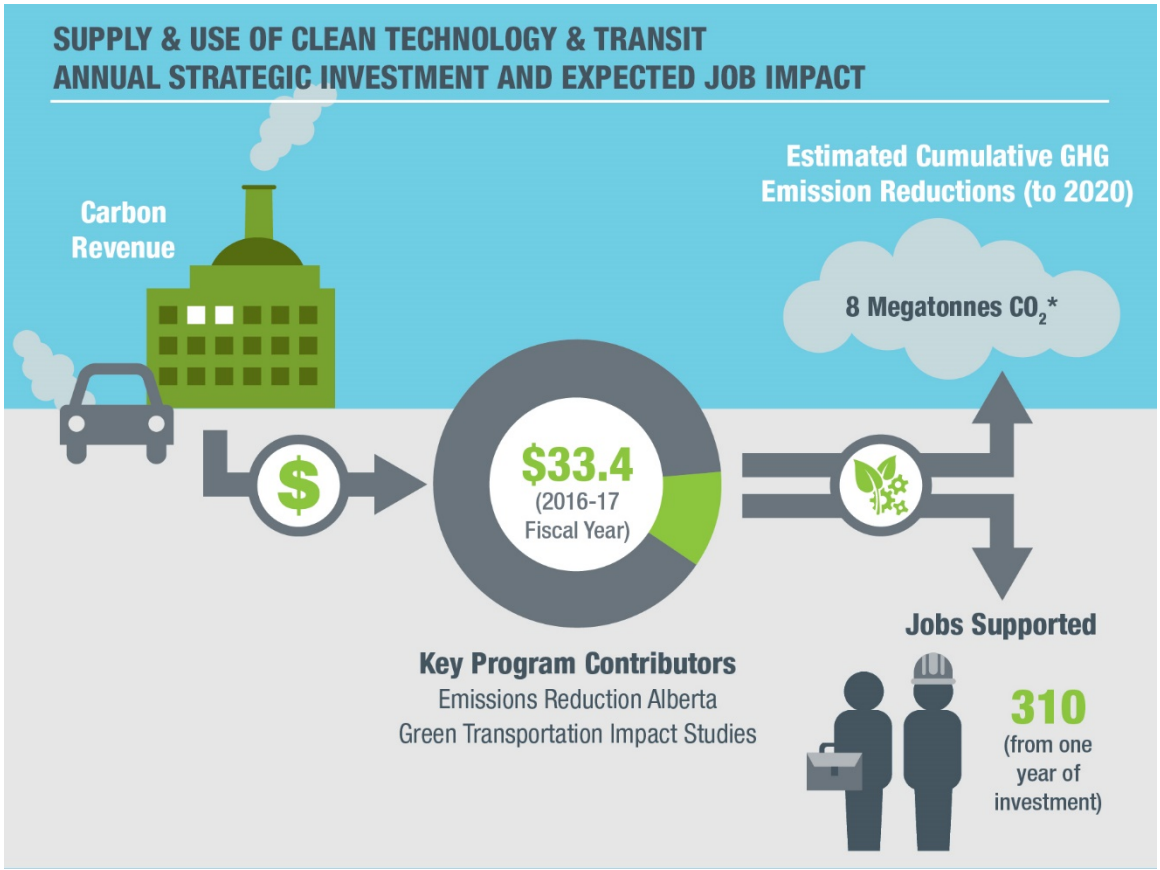
- Demonstrate innovation and clean technology **leadership & partnership** through actively leveraging collaboration and funding.
- **Reduce greenhouse gas emissions** through innovation & clean technology.

Transit:

- **Reduce greenhouse gas emissions** through increased usage of low-emission transport.
- Support **public well-being** through access to low-emission transportation.

STRATEGIC INVESTMENTS

$33.4 million was invested in 2016-17 towards achieving this action area. This investment supports the delivery of programs including Emissions Reduction Alberta (ERA) and transportation-related climate change programs. It's estimated that this investment supported approximately 310 jobs and will result in 8 Mt of cumulative emission reductions by 2020. *



* Estimated reductions are based on cumulative investments by ERA since 2011.

PROGRESS SUMMARY

Progress Summary and Progress Details for clean technology are currently based on available data and results achieved by ERA, an agency funded by the Climate Change and Emissions Management Fund to accelerate development of innovate technologies that reduce GHG emissions. ERA (formerly Climate Change and Emissions Management Corporation) has been in place since 2009. The CLP confirms the key role that innovation and clean technology play in achieving its outcomes and in 2016 began the development of the Climate Change Innovation and Technology Framework. Measures, indicators, information and associated results will be updated in future reporting to reflect the application of the Framework by ERA, the Ministry of Economic Development and Trade, as well as Alberta Innovates.

Performance Measures/Indicators	Baseline (2015)	Result (2016)	Target/ Desired Result	6 Year Trend	Status
1. Innovation Leadership and Partnership					
1.1 Clean Technology Investment *(total cumulative million $ invested in clean technology research & development, development, demonstration and implementation stages)*	270	294	NA	NA	NA
1.2 Leveraged Investment *(ratio of $ leveraged from additional funding partners for every $ invested by the Government)*	4.1	3.9	> 1.0	▼	●
1.3 Collaborative Partnerships (*qualitative results highlighting collaborative partnerships with governments, universities, research institutes/organizations, and industry)*	Table CT 1.3: Clean Technology Collaborative Partnerships				
2. Greenhouse Gas Emissions Reductions (Innovation and Clean Technology)					
2.1 Estimated GHG Emissions Savings – All Initiatives *(total estimated kilotonnes of CO2 equivalent GHG emissions savings from Innovation & Clean Technology initiatives)*	874.7	912.3	Increasing trend	▲	●
2.2 Estimated Methane Emissions Savings *(total estimated kilotonnes of CO2 equivalent methane emissions savings from Innovation & Clean Technology initiatives)*	74.9	53.8	Increasing trend	▲	●
2.3 Estimated GHG Emissions Savings – Electricity Initiatives *(total estimated kilotonnes of CO2 equivalent GHG emissions savings from Innovation & Clean Technology initiatives)*	595.3	605.5	Increasing trend	▲	●
3. Economic Development/Growth					
3.1 Innovation & Clean Technology Support of Oil Sands Emissions Reductions	3.1 Narrative Results				

3.2 Innovation & Clean Technology – Commercial Viability	3.2 Narrative Results				
4. Greenhouse Gas Emissions Reductions (Transit)					
4.1 Alberta Transit Ridership *(total # of public transit rides In millions aggregated for the province of Alberta)*	214.4	Available 2018	Increasing trend	▲ (5 year)	●
4.2 Alberta's Low-Carbon Fleet *(total number of non-diesel vehicles in Alberta's transit fleet as a percentage of Alberta's total transit bus fleet)*	5.6	Available 2018	Increasing trend	▲ (5 year)	●
4.3 GHG Emissions Savings from Transit initiatives *(total tonnes of CO2 equivalent GHG emissions savings from CLP-funded Transportation Initiatives)*	NA	TBD	TBD	TBD	TBD
5. Support Public Transit Accessibility					
5.1 Number of Affordable Housing Units within 1 kilometre of Major Transit Stations or Park and Rides *(in development)*	TBD	TBD	TBD	TBD	TBD

▲ Positive upward trend ▼ Positive downward trend ▲ Negative upward trend ▼ Negative downward trend
● Projected to meet or surpass target ● Projected to be near target ● Projected to be off target – Steady trend

PROGRESS DETAIL

1.1 CLEAN TECHNOLOGY INVESTMENT

Description

Clean Technology Investment measures the total invested by ERA in clean technology projects in millions of dollars over the calendar year. Results are rounded to the nearest million. Future CLP clean technology reporting will expand this definition and refine the associated methodology.

Importance

As an energyproducer, Alberta's success in reducing GHG emissions requires innovative processes and approaches that support lower costs while reducing emissions. The CLP is investing to accelerate the research, development and deployment of clean technology on which this innovation depends. It is important to monitor these investments and their associated results over time.

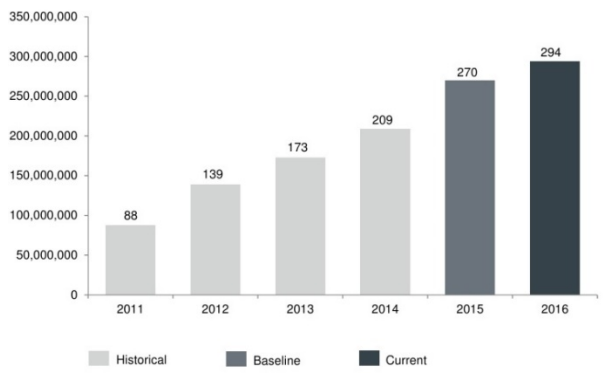
Target/Desired Result

NA.

Progress

From 2011 to 2016, ERA committed $294 million to 109 projects representing transformative technologies. These investments were distributed across all stages of innovation from R&D to implementation and represent potentially dramatic GHG emissions reductions. A large portion of funding committed to projects in the latter stages of innovation (demonstration and first-of-a-kind deployment) will achieve substantial emissions reductions in the near future. ERA funds projects in four areas: Reduced GHG Footprint of Fossil Fuel Supply; Low-Emitting Electricity Supply; Biological Resource Optimization; and Industrial Process Efficiency. In 2017, ERA committed a further $33 million to 13 methane-reducing projects from the ERA Methane Challenge. ERA also launched a $50 million Oil Sands Innovation Challenge in mid-2017, seeking innovative technologies to reduce GHG emissions and improve the cost competitiveness of bitumen production and processing.

Figure CT 1.1: Clean Technology Investment (millions of $ invested in ERA clean technology projects)



Data source: Emissions Reduction Alberta

1.2 LEVERAGED INVESTMENT

Description

Leveraged Investment measures investment by additional funding partners for every dollar invested by ERA as a ratio. A result greater than 1.0 means funding partners have invested more than 50 per cent of the total. This definition and methodology will expand for future reporting.

Importance

The government plays a key role in developing and commercializing clean technologies and innovation through investments. Partnerships maximizing the value of these investments, allowing for significant and sustained resources to support the development, implementation and commercialization of innovation and clean technology to make energy more efficient. These are particularly important where the advancement of certain technologies requires significant investment.

Target/Desired Result

>1.0.

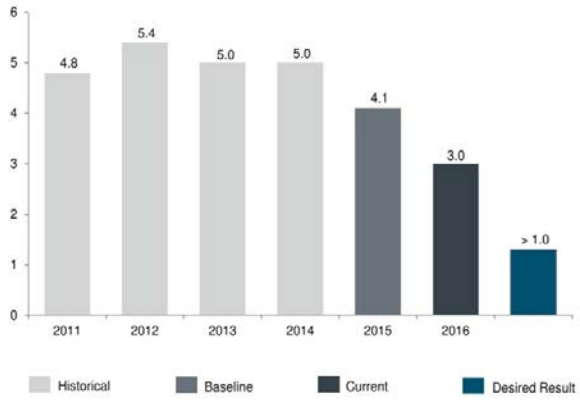
Progress

Illustrated results have been adjusted to exclude one outlier project from 2013. Blackspring Ridge Wind Project received $10 million from ERA to support total costs of approximately $600 million. Removing this project helps normalize the leverage figure for ERA's portfolio. The total investment of $294 million to 2016 contributed to projects valued at almost $2 billion. Removing the outlier means an investment of $284 million for projects valued at almost $1.4 billion. The decline in leverage reflects the economic slowdown and lower private capital availability, making ERA's investment even more critical.

The 2016 figure is still well above the 1.0 target, and represents a significant contribution to the economy.

The Department of Economic Development and Trade found that ERA's projects are expected to result in direct economic benefits, including supporting 1,400 jobs annually from 2011 to 2021, with a total cumulative impact of more than 15,000 person-years of employment. In addition, ERA projects are expected to add almost $1.8 billion to Alberta's GDP.

Figure ICT 1.2: Leveraged Investment (ratio of $ leveraged from additional funding partners for every $ invested by Government of Alberta)



Data source: Emissions Reduction Alberta

1.3 COLLABORATIVE PARTNERSHIPS

Collaborative and strategic partnerships are critical for the effective development and commercialization of clean technologies. And the Government, through its various initiatives, actively leverages domestic and international collaborations among inventors and research institutions, as well as industry and federal funders to accelerate technology development and address Alberta's market demands.

Table CT 1.3: Collaborative Partnerships identifies ERA's partners and collaboration by type. From supporting innovators to collaborating with government, investors and industry, ERA works with its partners to secure a lower carbon future.

Table CT 1.3: Clean Technology Collaborative Partnership

Partner Type	Organization	Collaboration Type			
		Funding	Strategic Alignment & Engagement	Proponent Training & Support	Conferences & Workshops
Federal Government	Sustainable Development Technology Canada (SDTC)	✓	✓	✓	✓
	National Resources Canada	✓	✓		✓
Provincial Governments & Agencies	Alberta Agriculture and Forestry		✓		
	Alberta Climate Change Office		✓		✓
	Alberta Economic Development and Trade		✓		✓
	Alberta Energy		✓		✓
	Alberta Energy Regulator		✓		✓
	Alberta Innovates	✓	✓	✓	✓
	Energy Efficiency Alberta		✓		✓
	MaRS – Discovery District		✓		✓
	Ontario Centres of Excellence	✓	✓		✓
Provincial Advisory Groups	Alberta Energy Efficiency Panel		✓		
	Alberta Diversification Advisory Committee		✓		
	Oil Sands Advisory Group (2017)		✓		✓
Municipal Agencies	Innovate Calgary		✓	✓	✓
	TEC Edmonton		✓	✓	✓
Academic	University of Alberta	✓	✓		✓

Institutions	University of Calgary	✓	✓		✓
	NAIT (2017)	✓	✓		
Industry, Organizations, Associations	Alberta Clean Technology Industry Alliance		✓		✓
	Canadian Association of Petroleum Producers		✓		✓
	Canada's Oil Sands Innovation Alliance		✓		✓
	EVOK Innovations	✓	✓		✓
	Energy Futures Lab		✓		✓
	Natural Gas Innovation Fund (Canadian Gas Association)(2017)	✓	✓		
Non-governmental Organizations	Pembina Institute		✓		✓

2.1 ESTIMATED GHG EMISSION REDUCTIONS – ICT INITIATIVES

Description

Estimated GHG Emissions Reductions – ICT Initiatives measures the estimated annual tonnes of CO2 equivalent GHG emissions that ERA initiatives have saved. ERA calculates two different but related emissions reductions projections for its investment portfolio. One is the total GHG emissions reductions expected from each project directly. This value is provided by the project proponents and reviewed by ERA. The other is the market potential for GHG reductions, and estimates total emissions reductions expected from commercialization of the technology.

A number of assumptions underpin this calculation, including policies and measures currently in place and arising from the successful commercial adoption of technologies, GHG emissions intensity, estimated market size, economic indicators and the lifespan of the technology.

ERA can make a significant impact through supporting the development of breakthrough technologies, but estimating the impact of new, game-changing technologies is difficult. While they can lower GHG emissions significantly in the long term, they also carry considerable risk, making it difficult to predict when a breakthrough may occur. To balance that risk, a large portion of ERA funding is committed to projects in later stages of innovation, and which result in substantial near-term emissions reductions. ERA continues to refine the methodology used for estimating market potential and is also working on longer projection timelines (to 2050) to allow for a more complete look at longer-term emission reductions.

Importance

Investment in innovation and clean technology is recognized as a key lever to helping industry

reduce GHG emissions while saving money. Since innovation and clean technology is a long term strategy, it's important to monitor the impact of investments over time as well.

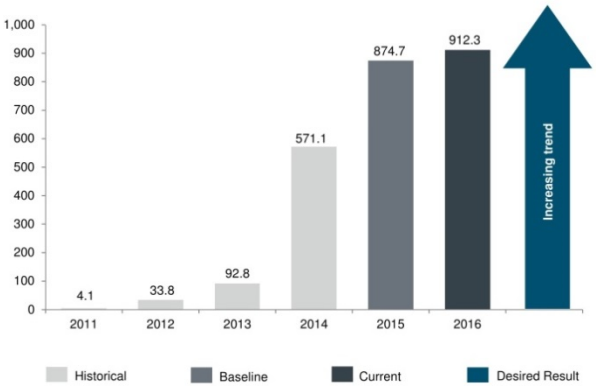
Target/Desired Result

Increasing trend.

Progress

Cumulative emissions reductions for projects funded since 2011 are estimated to be more than 2 Mt. Annual results in Figure CT 2.1 show a significant increase for both 2014 and 2015. This is largely explained by the Blackspring Ridge Wind Project, which was funded in 2013, became operational for part of 2014 with its first full year of production in 2015. These emission reductions account for over half the emissions reductions for those years. Less significant increases are noted in 2016 due to project completions, and projections for 2017 onwards are based on current forecasts of the project portfolio. Cumulative project-level emissions reductions are estimated to be 8 Mt by 2020 and 27 Mt by 2030 for the existing portfolio.

Figure CT 2.1: Estimated GHG Emissions Reductions – ICT Initiatives (estimated annual kilotonnes of CO_2 equivalent GHG emissions reductions from ERA's Innovation & Clean Technology Initiatives)



Data source: Emissions Reduction Alberta data collection

2.2 ESTIMATED METHANE EMISSIONS REDUCTIONS – ICT INITIATIVES

Description

Estimated Methane Emissions Reductions - ICT Initiatives measures the estimated annual tonnes of CO_2 equivalent methane emissions reductions from ERA initiatives. ERA has identified that these funded projects will specifically reduce methane gases and contribute to the target of reducing methane emissions by 45 per cent by 2025. A proportion of the reported emissions reductions are also attributed to this measure.

Importance

Investment in innovation and clean technology is a key lever for helping industry reduce GHG emissions while saving money. Since innovation and clean technology is a long-term strategy, it's important to monitor the impact of these investments over time.

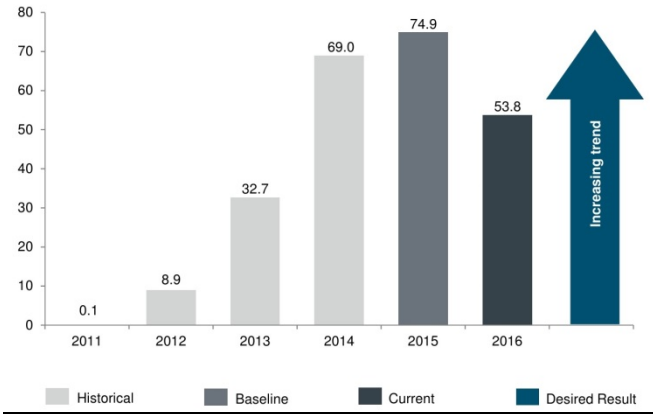
Target/Desired Result

Increasing trend.

Progress

While the results to date have been relatively modest for the methane component, it should be noted that in 2017 ERA funded 13 projects specifically targeted at methane reduction. These aim to accelerate the development of technologies that monitor, detect and reduce methane emissions. These new projects alone are estimated to lower emissions by 400 kilotonnes by 2020 and 2.4 Mt by 2030.

Figure CT 2.2: Estimated Methane Emissions Reductions – ICT Initiatives (estimated annual kilotonnes of CO_2 equivalent GHG emissions reductions from ERA's Innovation & Clean Technology Initiatives)



Data source: Emissions Reduction Alberta data collection

2.3 ESTIMATED GHG EMISSION REDUCTIONS – ELECTRICITY ICT INITIATIVES

Description

Estimated GHG Emissions Reductions - Electricity ICT Initiatives measures the estimated annual tonnes of CO_2 equivalent GHG emissions reductions from electricity projects funded by ERA.

Importance

Transitioning Alberta's electricity system to lower carbon is a key objective of the CLP. New technologies and innovation will play key roles in maintaining system reliability (smart-grid, energy storage, etc.) and diversifying the generation capacity.

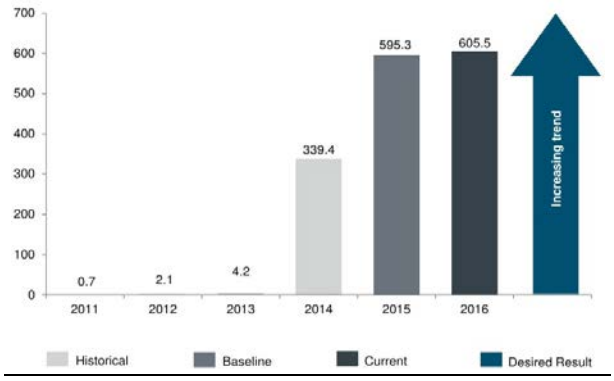
Target/Desired Result

Increasing trend.

Progress

There is a significant increase for 2014 and 2015, largely explained by the Blackspring Ridge Wind Project. It was funded in 2013, became operational for part of 2014, and has operated continually since 2015. These

Figure CT 2.3: Estimated GHG Emissions Reductions – Electricity ICT Initiatives *(estimated annual kilotonnes of CO_2 equivalent GHG emissions reductions from ERA's Electricity Innovation & Clean Technology Initiatives)*



Data source: Emissions Reduction Alberta

project-level emission reductions account for over 90 per cent of the total electricity emission reductions for those years. Projections for 2017 and beyond are based on current expectations of the project portfolio. Cumulative project-level emissions reductions are estimated to be 4 Mt by 2020 and 11 Mt by 2030 for the existing low-emitting electricity supply portfolio.

3.1 INNOVATION AND CLEAN TECHNOLOGY OF OIL SANDS EMISSIONS REDUCTIONS

ERA is responsible for projects that address climate leadership priorities, including the 100 Mt oil sands emissions cap. One key strategic focus is the reduced GHG footprint of fossil fuel supply, and as of 2016, ERA had committed $122 million this strategic area. It offers transformative technologies that can reduce GHG emissions over the long term and maximize the value of Alberta's resources. There are a total of 34 projects with a value of $631 million that represent estimated cumulative emissions reductions of 1.3 Mt by 2020 and 3.3 Mt by 2030.

ERA has partnered with 20 small- and medium-sized enterprises, and 21 of the projects are now complete. Looking forward to 2017-18, ERA has funded 11 more projects in the Methane Challenge, two of which focus specifically on the oil sands. A further $26 million has been committed with an estimated total project value of $59 million. And as well, ERA launched a $50 million Oil Sands Innovation Challenge seeking innovative technologies that reduce GHG emissions while lowering the cost of bitumen production and processing. Preliminary expressions of interest have been submitted and those shortlisted have been invited to submit a full proposal.

3.2 INNOVATION AND CLEAN TECHNOLOGY – COMMERCIAL VIABILITY

The development and acceleration of clean technology falls in four stages: research and development; development; demonstration; and implementation. Technologies in the development and implementation phases are closest to commercial viability. Table CT 3.2 identifies current ERA projects with the strongest likelihood for commercialization, though this depends on market need or uptake, funding, production and other factors.

Table CT 3.2: Innovation and Clean Technology – Commercial Viability

Organization	Project Title	Innovation Stage
City of Medicine Hat	Medicine Hat Concentrating Solar Thermal Power Demonstration Project	Demonstration
Enmax Coporation	ENMAX Micro Renewable Energy Program	Implementation
E-T Energy	Commercial Demonstration of ET-DSP ™ in the Athabasca Oil Sands	Demonstration

Evergreen Energy Technologies Inc.	Power Pod, Reliable Power for Remote Locations	Demonstration
Lethbridge Biogas Limited Partnership	Lethbridge Biogas/Cogeneration Project	Implementation
Suncor Energy Inc. Oil Sands	Alberta Oil Sands Energy Efficiency & GHG Mitigation Roadmap Program	Implementation
Suncor Energy Inc. Oil Sands	OTSG Oxy-fuel Demonstration Project	Demonstration
Alliance Pipeline (NR Green Limited Partnership)	Whitecourt Energy Efficiency Project	Demonstration
Cenovus Energy Inc	Installation of Air/Fuel Ratio Controllers and Vent Gas Capture on Engines	Implementation
ConocoPhillips Canada	Company-Wide Rollout of a Systematic Energy Efficiency Program Leading to Significant GHG Reductions in Alberta's Oil and Gas Industry	Implementation
EnCana Corporation	Vent Gas Capture for Engine Fuel Use	Implementation
Weyerhaeuser Company Limited	Weyerhaeuser Grande Prairie Evaporator Project	Implementation
West Fraser Mills Ltd	Bio-Methanation with Power Generation	Implementation
N-Solv Corporation	Solvent Based Gravity Drainage for SAGD Applications	Demonstration
Hi-Tec Fuel and Auto Ltd	Controller Systems to Utilize up to 50% NG with Diesel in Vehicles	Demonstration
Salt Canada Inc.	Air Injection into Ft. McMurray Landfill to Encourage CH4 to CO2	Demonstration
Saltworks Technologies Inc.	Low Severity ZLD using OTSG water	Implementation
Blackspring Ridge/Wind Project	300 MW Wind Energy Project – Utility Scale – Largest Wind Energy Project in Canada – Greengate Power Corporation	Implementation
Growtec	Source Separated Organics and Agricultural Waste Anaerobic Digester	Implementation
B&C Energy Services, Inc.	Innovative Enzergy™ Bio Enzymatic Coal Treatment Will Significantly Reduce GHGs and other Pollutants at Favorable Cost, Reduce Plant Life Cycle Costs, and Enable Alberta's Use of Lower Quality Coal	Demonstration
Canadian Fertilizer Institute I	Implementation of 4R Nutrient Stewardship and the NERP in AB	Demonstration
Canadian Fertilizer Institute II	Implementation of 4R Nutrient Stewardship and the NERP in Alberta (Phase 2)	Demonstration
Carleton University – Carlos Montreal	Intelligent NanoFertilizers - The Dynamics of Soil Bacterial Genomics Associated with Root Exudates and Nitogen Uptake by Wheat and Canola	Demonstration
The Prasino Group	Piloting the Days on Feed and Reduced Age at Harvest Protocols in Alberta /Piloting the Nitrous Oxide Emissions Reduction Protocol in Alberta	Demonstration

New Sky Energy	Soda Ash and Biocarbonate from a Low Energy Natural Gas Sweetening Process	Demonstration

4.1 ALBERTA TRANSIT RIDERSHIP

Description

Alberta Transit Ridership measures the total number of conventional, auxiliary, and specialized trips, including reduced fare trips for seniors or students, in a year as reported by municipalities/regions to the Canadian Urban Transit Association (CUTA). Conventional transit services include regular scheduled bus and light rail. Auxiliary trips are defined as any transportation service where routes and schedules are arranged to meet the needs of passengers who sign up in advance, or which may cross municipal boundaries. Specialized service provides door-to-door demand response, such as transit for people with disabilities.

As data are dependent on reporting regions, there may be gaps. As an example, one community reported for only three of the five years. This does not significantly impact the results as the community in question represents about one per cent of ridership. 2016 results will not be available from CUTA until 2018.

IMPORTANCE

Using public transportation uses less energy and produces less pollution than travelling in private vehicles. By reducing the growth in private vehicle kilometers of travel, easing congestion and supporting more efficient land use patterns, public transportation reduces CO_2 emissions (American Public Transportation Association, The Benefits of Public Transportation). Increased use of public transit also indicates public behavior changes that help achieve CLP outcomes.

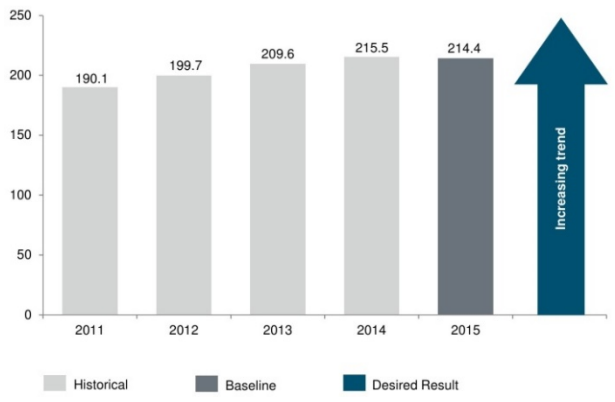
TARGET/DESIRED RESULT

Increasing trend.

PROGRESS

Results from 2011 through 2015 show an increasing trend in transit ridership. This reflects efforts and investment by municipal and the provincial governments to provide more options for public transportation.

Figure CT 4.1: Alberta Transit Ridership (total # of public transit rides in millions aggregated for the province of Alberta)



Data source: Canadian Urban Transit Association: Canadian Transit Fact Book, Operating Data (2011-2015).

4.2 ALBERTA'S LOW CARBON FLEET

Description

Alberta's Low Carbon Fleet measures the number of non-diesel vehicles as a share of the transit bus fleet as reported by municipalities/regions to the Canadian Urban Transit Association. Non-diesel vehicles include hybrid, biodiesel, gasoline, electric and compressed natural gas vehicles. As data are dependent on reporting regions, there may be gaps, and 2016 results will not be available from CUTA until 2018.

Importance

As Alberta focuses on boosting public transit use, it's important to ensure that public transit options also move towards lower emissions intensity. This indicator monitors Alberta's progress towards low-emission public transportation.

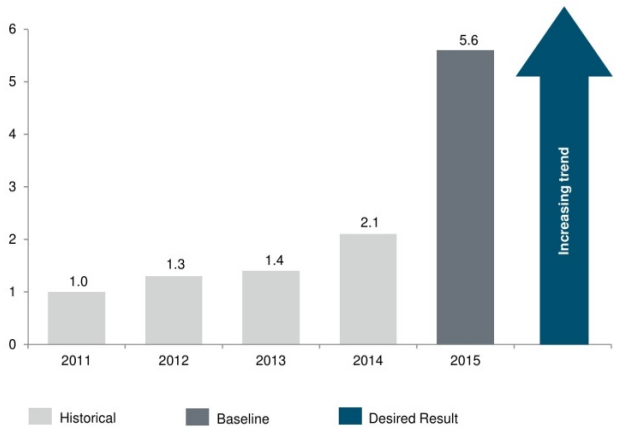
Target/Desired Result

Increasing trend.

Progress

The 2011 through 2015 results show an increasing trend in the low carbon fleet percentage with a significant increase in 2015. This increase is primarily due to adding 90 non-diesel vehicles to Calgary's public transit fleet, and Strathcona County adding five non-diesel vehicles. These results reflect the efforts and investment by municipal and provincial governments to provide more options for public transportation.

Figure CT 4.2: Alberta's Low Carbon Fleet *(total number of non-diesel vehicles in Alberta's transit fleet as a percentage of Alberta's total transit bus fleet)**



Data source: Canadian Urban Transit Association: Canadian Transit Fact Book, Operating Data (2011-2015)

**Numbers are based off of the total number of non-diesel vehicles, including gasoline, hybrid and biodiesel, electric and compressed natural gas (CNG)*

4.3 GHG EMISSIONS REDUCTIONS FROM TRANSPORTATION INTIATIVES

Greenhouse Gas Emissions Reductions (Transit) will measure the total tonnes of CO_2 equivalent GHG emissions reductions from CLP funded transportation initiatives. Methodology and results for this indicator will be provided and reported on in future CLP Progress Reports.

5.1 AFFORDABLE HOUSING UNITS PUBLIC TRANSIT ACCESSIBILITY

Affordable Housing Units Public Transit Accessibility will measure the total number of affordable housing units within one kilometre of major train stations or park-and-rides. Increasing the number of affordable housing units with good access to public transit options helps increase transit ridership, which reduces GHG emissions, and improved community wellbeing.

Methodology and results for this indicator will be provided and reported on in future CLP Progress Reports.

CLEAN TECHNOLOGY AND TRANSIT PROGRAM CONTRIBUTORS

FUNDED IN 2016-17	
Primary	Additional
• Emissions Reduction Alberta Grant • Green Transportation Impact Studies	• Alberta Carbon Capture and Storage Program

ANNOUNCED IN 2017-18 Preliminary 2017 – Includes programs announced as of August 31, 2017
Primary
• Climate Change Innovation Technology Framework • Alberta Carbon Conversion Technology Centre • LRT – Calgary Green Line • LRT – Edmonton Southeast Valley Line Phase 1 • Green Transit Incentives Program

PROGRAM HIGHLIGHTS

8 Megatonnes

Projected cumulative GHG emission reductions from Emissions Reduction Alberta funded projects (2011 to 2020)

24 Projects

Awarded up to $500K under Emissions Reduction Alberta Grand Challenge: Innovative Carbon Use

$32.8 Million

Awarded to 13 projects through Emissions Reduction Alberta Methane Challenge (2017)

PROGRAM RESULTS

2016-17 Primary Contributors

Programs/Projects	2016-17		2017-18 Actions/Next Steps	Estimated Cumulative GHG Reductions to 2020 (tonnes)
	Funding	Milestones		
Emissions Reduction Alberta Grant Emissions reduction Alberta supports the innovation as well as the research and development of clean technology. Funded projects address many market demands, including those in response to Alberta's methane reduction target and the oil sands emission cap. Funding comes from large final emitters who choose to pay into the Climate Change and Emissions Management Fund if they are unable to meet emissions reduction targets.	$33M	With stakeholders, roadmaps were developed to guide investment decisions and portfolio mix: • Technology Roadmap. • GHG Mitigation Roadmap. Completed a joint funding initiative with Sustainable Development Technology Canada (SDTC) to advance technology solutions that are deployable in Alberta. ERA Grand Challenge: Innovative Carbon Use: • Focus on technologies that transform carbon dioxide from waste material to an asset. • Round 1: 24 projects were awarded up to $500K each to develop their technologies. • Round 2: Four technologies were awarded up to $3M each to accelerate technologies over the next two years. • One of these projects will be awarded $10M in additional funding when the Grand Challenge concludes in 2019 to help commercialize their technology in	Ongoing support to funded projects. Continue to foster existing and forge new domestic partnership and collaborations. ERA Methane Challenge: • Focus on field-pilot and demonstration projects for methane monitoring, detection and reduction in the oil and gas, power generation, agriculture and forestry sectors. • 13 projects were awarded funding, totaling $32.8M. • GHG emission reductions projected to be 1.3 Mt by 2020. ERA Oil Sands Innovation Challenge: • Competition issued seeking innovative technologies that reduce GHG emissions and improve the cost competitiveness of bitumen production and processing within in situ or mined oil sands operations.	8 Mt (from 2011 to 2020)

		Alberta. • GHG emission reductions from winning projects are expected to generate 1 Mt of annual market emissions.	• $50M available to help the oil sands sector meet the province's cap on oil sands emissions at 100 Mt per year. • Winners to be selected and awarded funding. Shortlist applications invited to submit Full Project Proposals were notified in October 2017.	
Green Transportation Impact Studies These projects conduct impact and feasibility studies to identify the role that public and private investment can play in supporting reductions from passenger and freight transportation, as we provide guidance on future operating implications for the transportation network and estimate future consumer uptake in Alberta.	$180K	Electric Vehicle Impact Study: • Contractor selected to commission feasibility study. • Final report including recommendations to improve the update of lower emitting vehicles. Truck Stop Electrification Feasibility Study: • Contractor selected to commission feasibility study. • Final report including recommendations to improve the update of lower emitting vehicles.	Topics for additional feasibility studies will be selected as information is required.	*Enables GHG emissions reductions by providing information on possible options for further investment.*

2016-17 Additional Contributors

Programs/Projects	2016-17		2017-18 Actions/Next Steps	Estimated Cumulative GHG Reductions to 2020 (tonnes)
	Funding	Milestones		
Alberta Carbon Capture and Storage Program The Alberta Carbon Capture and Storage (CCS) funding program supports the construction and operation of two large-scale CCS projects until 2025: the Quest CCS Project and the Alberta Carbon Trunk Line Project.	$49.3M	Quest CCS Project: • First Year of Commercial Operation - CO2 Injection Payment ($29.5M). ACTL CCS Project: • North West Redwater Partnership Construction milestone #2 ($19.8M).	Quest CCS Project: • Received a second injection payment for its net tonnes of carbon dioxide sequestered (Fall 2017). ACTL CCS Project: • No other construction milestone payment is due for the ACTL project in 2017. • Project expected to be operation in the fourth quarter of 2018/19 fiscal year.	2.8M/year[7]

Programs Announced in 2017-18 (preliminary as of August 31, 2017)

Programs/Projects	2017-18 Actions/Next Steps	Estimated Cumulative GHG Reductions to 2020 (tonnes)
Climate Change Innovation Technology Framework Climate Change Innovation Technology Framework supports innovation, as well as the research and development of clean technology. Funded projects will support	Established the Climate Technology Task Force. The task force engaged with innovation system leaders and stakeholders and completed a report of recommendations to government to support the development of the CCITF. The development, approval and launch of the CCITF programs are in progress.	TBD

[7] 1 The Quest Project is expected to capture 1.08 Mt of CO2 each year for deep geological storage. Once operational, the ACTL Project is expected to capture approximately 1.68 Mt of CO2 from the Agrium fertilizer plant and the North West Refinery for enhanced oil each year.

and create the necessary pathways to achieving a lower carbon economy.		
Alberta Carbon Conversion Technology Centre The Alberta Carbon Conversion Technology Centre in Calgary will be a state-of-the-art research facility that will allow new carbon-use technologies to be tested on near-commercial scale. This initiative is additionally supported by the Government of Canada.	Secured funding from the Government of Alberta and the Government of Canada (Natural Resources Canada). Ministerial order enabling the acquisition of the Alberta Carbon Conversion Technology Centre by InnoTech Alberta Inc. signed. Construction started. Grant Agreement between Economic Development and Trade and InnoTech Alberta to be signed.	*Enables GHG emission reductions by supporting clean technology development and deployment.*
LRT – Calgary Green Line Alberta will expand the Calgary LRT network adding 20 kilometers of track and 14 stations from downtown Calgary towards the southeast. This initiative will be further supported by the Government of Canada and represents one of the largest infrastructure investments in Alberta's history.	Extensive engagement with the public in neighborhoods surrounding proposed LRT line: • Information sessions. • Guided walkabouts. • Community meetings. • Brochure distribution. Website development to provide public information. Land purchased for LRT line infrastructure (municipality funded). Continue public engagement activities to provide update on Phase 1 of the new LRT line. Execute funding agreement between Government of Alberta and City of Calgary for LRT Calgary Green Line. Construction will begin in late 2019 or early 2020. The LRT line is expected to be completed in 2026.	30,000/year[8]
LRT – Edmonton Southeast Valley Line Phase 1 Alberta will expand the Edmonton LRT network, adding 13 kilometers of track and 12 stations between Mill Woods	Construction of the LRT line under previously approved funding (April 2016). Previously approved loan converted into a grant. Continued construction of LRT line.	4,500/year[9]

[8] Estimated greenhouse gas (GHG) emission reductions starting post project completion. LRT expected to be operational by 2026.
[9] Estimated greenhouse gas (GHG) emission reductions starting post project completion. LRT expected to be operational by 2020

and downtown.	Phase 1 completion expected to be 2020.	
Green Transit Incentives Program (GreenTRIP) GreenTRIP supports capital projects in municipalities that lower greenhouse gas emissions by reducing reliance on single-occupancy vehicles such as the purchase of electric buses or transit facility upgrades such as LED lighting. Funded initiatives are further supported by the Government of Canada's Public Transit Infrastructure Fund.	Round 1 (not supported by Climate Leadership funding): • 49 projects supported in Calgary and Edmonton. Round 2 (not supported by Climate Leadership funding): 52 projects from across Alberta. Round 3 (partially supported by Climate Leadership funding): • Call for project applications executed. Round 3 Climate Leadership funding projects selected: • City of Red Deer purchase of 20 new CNG buses. • City of Cold Lake Bus Stop Enhancement and GPS Scheduling. • City of Grande Prairie Electric Bus Program – Replacement. • City of Grand Prairie purchase of 3 new electric buses. Additional GreenTRIP projects supported outside of Climate Leadership funding. Distribute payments to municipalities based on project delivery progress.	3, 400

SUPPORT AND ENGAGEMENT

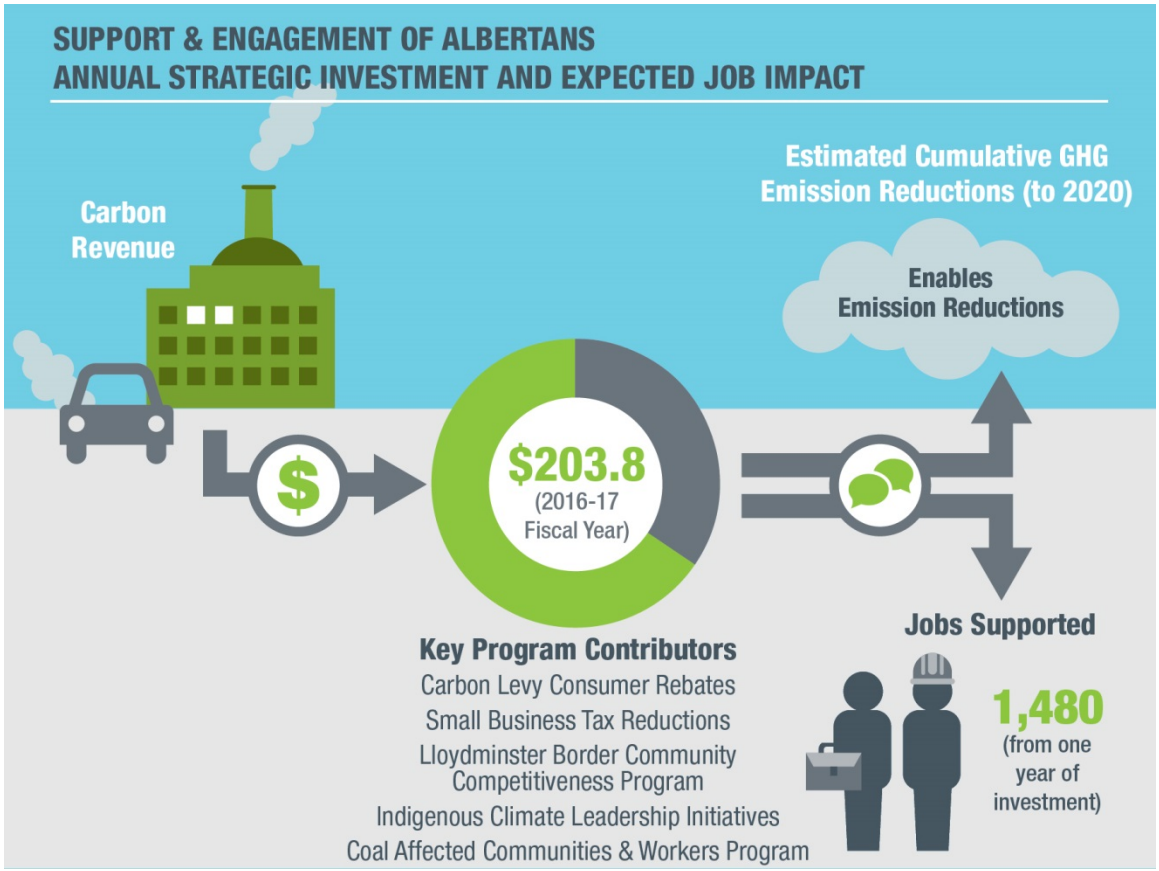
OBJECTIVES AND TARGETS

Throughout the development and implementation of the CLP, the Government is committed to supporting, engaging and collaborating with Albertans and key stakeholders, including representatives from potentially affected communities and Indigenous communities and organizations. Support and engagement focuses on the following objectives:

- **Support Albertans in the transition to a lower carbon economy.**
    - Low- and middle-income carbon levy rebates.
    - Small business tax cut.
- **Ensure meaningful inclusion and ongoing engagement of Indigenous communities and organizations in all aspects of the CLP.**
    - Enable Indigenous communities and organizations to develop green energy projects leading to an overall reduction in GHG emissions.
    - Support Indigenous communities and organizations to better understand how energy is used locally, and plan more effectively for opportunities and challenges related to renewable energy.
    - Create a new relationship between Indigenous peoples and the Government through potential opportunities such as an innovative joint decision-making governance model to develop and manage the Indigenous Climate Leadership Initiative.
    - Establish meaningful dialogue to support Indigenous participation in Alberta's electricity market, particularly in the Renewable Electricity Program.
    - Enhance climate literacy through the exchange of traditional knowledge and western science regarding climate change.
- **Ensure engagement of Albertans and key stakeholders along the engagement spectrum (share information, build awareness, build relations and collaborative partnerships).**

STRATEGIC INVESTMENTS

$203.8 million was invested in 2016-17 towards achieving this action area. The investment includes carbon levy rebates, the small business tax cut, and Indigenous engagement and capacity building. It is estimated that this investment supported about 1,480 jobs and will help reduce emissions.



PROGRESS SUMMARY

The following measures, indicators and information helps monitor progress towards achieving increased support and engagement of Albertans.

Performance Measures/Indicators	Baseline* (2015)	Result (2016)	Preliminary Result (2017)	6 Year Trend	Status
1. Support Albertans					
1.1 Climate Leadership Consumer Rebates *(millions of $ of carbon levy revenue provided to low and middle income Albertans)*	0	NA	152**	NA	NA
1.2 Small Business Tax Cut Contributions *(millions of $ of carbon levy revenue used to finance small business tax cut)*	0	NA	40**	NA	NA

*CLP applies a baseline of 2015. The carbon levy was not implemented until January 2017 so 2015 results are zero and 2016 results are not applicable.

** 2017 results are preliminary as carbon levy rebates are based on a benefit year of July to June and there is a lag in data from the Canada Revenue Agency.

Performance Measures/Indicators	Baseline (2015)	Result (2016)	Target/ Desired Result	6 Year Trend	Status
2. Ensure Inclusion and Engagement of Indigenous Communities and Organizations					
2.1 Indigenous Climate Leadership Investments *(millions of $ invested in Indigenous communities and organizations climate leadership projects)*	0	5.8	TBD	TBD	TBD
2.2 GHG Reductions from Indigenous Climate Leadership Programs *(tonnes of CO2 equivalent emissions) (in development)*	0	TBD	TBD	TBD	TBD
2.3 Indigenous Climate Leadership Engagement *(qualitative results)*	See 2.3 Narrative Results				
Additional/alternative measures/indicators are in development.					
3. Ensure Engagement of Albertans and Stakeholders					
3.1 Climate Leadership Engagement Activities *(# of climate leadership engagement activities delivered). Progress Detail provides a breakdown by AP2 spectrum levels – Inform, Consult, Involve,*	0	163	Maintain or increase	NA	●

Collaborate					
3.2 Climate Leadership Engagement Participants *(# of people who participated in engagement activities). Progress Detail provides a breakdown by AP2 spectrum levels – Inform, Consult, Involve, Collaborate*	0	24,316	Maintain or increase	NA	●

▲ Positive upward trend ▼ Positive downward trend ▲ Negative upward trend ▼ Negative downward trend
● Projected to meet or surpass target ● Projected to be near target ● Projected to be off target – Steady trend

PROGRESS DETAIL

1.1 CLIMATE LEADERSHIP CONSUMER REBATES

Description

Climate Leadership Consumer Rebates measures the total amount of carbon levy rebates provided to low- and middle-income Albertans in millions of dollars over a benefit year (July to June). Payments are delivered in four quarterly installments.

Full rebates are provided to single Albertans who earn $47,500 or less, and to couples, single parents and families who earn $95,000 or less. Additional households receive a partial rebate. The rebate is automatically given to Alberta residents who file a tax return and meet the income criteria. The data source is the Canada Revenue Agency and 2017 benefit year results will not be available until 2018.

Importance

Rebates are provided to lower and middle-income Albertans to offset costs associated with the carbon levy. The rebates protect those who spend a higher percentage of income on energy costs and have fewer financial resources to invest in energy efficiency products. The rebate is tied to income and household size. Since it is not tied to energy use, eligible recipients have an incentive to reduce emissions.

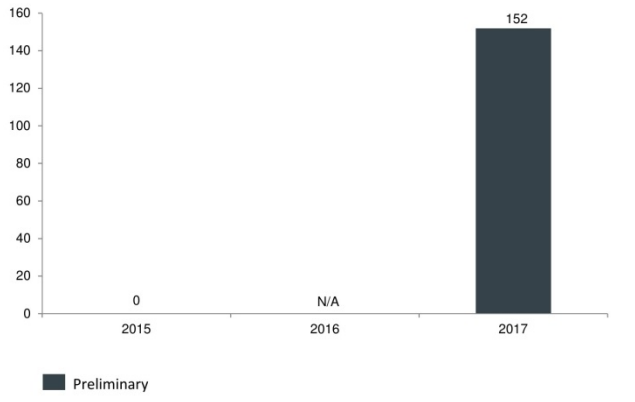
Target/Desired Result

NA.

Progress

The latest data indicate $152 million was provided to low and middle-income Albertans in the 2017 benefit year. Rebate amounts will increase in 2018 to coincide with the increased carbon levy rates.

Figure SE 1.1: Climate Leadership Consumer Rebates (millions of $ of carbon levy revenue provided to low and middle income Albertans)



Data source: Canada Revenue Agency

1.2 SMALL BUSINESS TAX CUT CONTRIBUTIONS

Description

Small Business Tax Cut Contributions measures the total amount of carbon levy revenue used to finance the small business tax cut in millions of dollars.

Importance

To help adjust to the carbon levy, small business corporate income tax rate was reduced by one third, from 3 per cent to 2 per cent effective January 1, 2017. While the carbon levy is intended to incent behaviour change, the Government is also committed to supporting small businesses as they transition to a lower carbon economy.

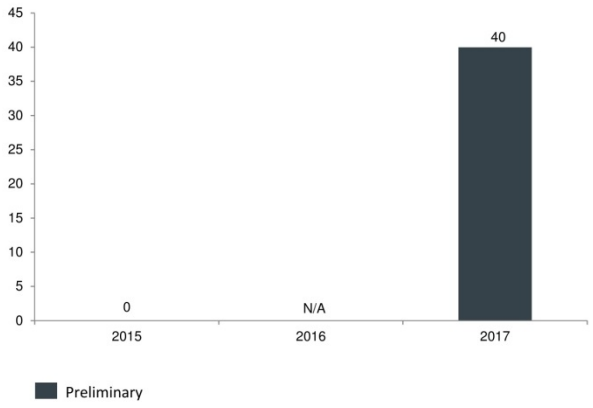
Target/Desired Result

NA.

Progress

The latest available data indicate $40 million of the carbon levy has been used to finance the small business tax cut. It is projected that the actual 2017 result will be approximately $185 million.

Figure SE 1.2: Small Business Tax Cut Contributions (millions of $ of carbon levy revenue used to finance small business tax cut)



Data source: Alberta Treasury Board and Finance

2.1 INDIGENOUS CLIMATE LEADERSHIP INVESTMENTS

Description

Indigenous Climate Leadership Investments measures the total amount invested in Indigenous communities' and organizations' climate leadership programs and their development over the course of the 2016-17 budget year (April - March) in millions of dollars. In 2016-17, program activities generally fell under four categories: planning, infrastructure, climate leadership awareness and training. All programs work to increase Indigenous peoples' awareness, capacity and participation in climate leadership initiatives that can reduce community GHG emissions and support communities' transitions to a lower carbon economy.

Importance

The Climate Leadership Advisory Panel report said it's expected that many Indigenous communities will experience more of the impacts of climate change due to factors including their locations, their economic situations and reliance on the environment. The Government is committed to ensuring this reality is expressly taken into account as carbon levy revenue is invested.

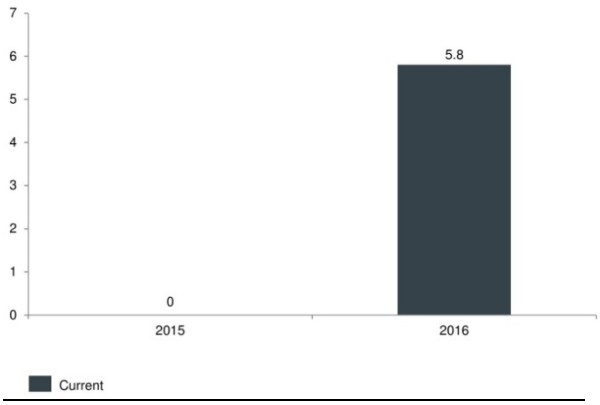
Target/Desired Result

TBD.

Progress

In the 2016-17 budget year, $5.8 million was invested in Indigenous communities and organizations. This funded two pilot programs (the Alberta Indigenous Community Energy Program and the Alberta Indigenous Solar Program), engagement and capacity building in Indigenous organizations, the Lubicon Lake Band Green Infrastructure Assessment, and supporting Indigenous communities adversely affected by the phase out of coal-fired emissions. The investment also supported engagement with Indigenous leaders on a joint decision-making body to lead the Indigenous Climate Leadership Initiative and to help develop seven transitional Indigenous climate programs launched in June 2017.

Figure SE 2.1: Indigenous Climate Leadership investments (millions of $ invested in Indigenous communities and organizations climate leadership projects)



Data source: Alberta Climate Change Office, Implementation Branch, Planning and Reporting

2.2 GHG REDUCTIONS FROM INDIGENOUS CLIMATE LEADERSHIP PROGRAMS

Description

GHG Reductions from Indigenous Climate Leadership Programs measures the annual GHG emission reductions in tonnes of CO_2 equivalent achieved by Indigenous climate leadership programs that directly reduce GHG emissions. While all Indigenous climate leadership programs support GHG emission reductions or the potential to reduce emissions, many will achieve this indirectly. GHG emissions reductions are calculated using methodologies specific to the project type (for example, solar projects) and the results aggregated for all direct emission reduction programs.

Importance

Indigenous peoples are at the forefront of the effects of climate change and the government is committed to ensuring they are able to participate in all aspects of Alberta's CLP. All Indigenous climate leadership programs work to help reduce GHG emissions and it is important to monitor their direct impacts on emissions reductions.

Target/Desired Result

TBD.

Progress

In 2016, one Indigenous climate leadership program was implemented which resulted in direct GHG emission reductions: the Alberta Indigenous Solar Program. Through the installation of solar photovoltaic systems in Indigenous communities, GHG emissions will be reduced or avoided. Projected GHG emission reductions or avoidance will be available in 2018.

2.3 INDIGENOUS CLIMATE LEADERSHIP ENGAGEMENT

Table SE 2.3 identifies and describes key Indigenous climate leadership engagement activities as well as the progress made and the importance of these activities.

Table SE 2.3: Indigenous Climate Leadership Engagement

Key Engagement Initiative	Description	Progress	Importance
Development of CLP	• Climate Change Advisory Panel held meetings with Indigenous communities in Calgary, Edmonton and Fort McMurray.	As a result, the panel incorporated the following key recommendations in the plan: • Concrete partnerships with First Nations and Métis communities on renewable energy and energy	Active engagement with Indigenous communities, organizations and members in the development of mechanisms devoted both to climate change mitigation and to future work on climate change adaptation. This

	• Panel met with 47 First Nation and Métis leaders. • Participants discussed outcomes, priorities and community interests related to climate change and Aboriginal peoples' perspectives.	efficiency. • Protecting vulnerable Indigenous communities from the impacts of carbon pricing. • Assistance in the development of a centre of Aboriginal peoples' knowledge to support implementation of climate change and adaptation policies.	is a key element of the CLP and aligns with the government's commitment to renew and improve its relationship with Indigenous people. The objective of this engagement is to ensure that Indigenous communities can be partners in advancing climate change outcomes and ensure that their unique needs and opportunities are understood and considered throughout the development and implementation of Alberta's CLP.
Advisory Panel on Coal Communities	Government formed an Advisory Panel on Coal Communities (APCC) to ensure workers and community members are consulted in order to understand their challenges and ideas for the long-term economic sustainability of their communities, and to provide comprehensive advice and options to the government on an approach to support affected workers and communities.	The APCC held facilitated discussions with stakeholders and First Nations in communities most affected by the retirements of coal-fired generation facilities and associated mining operations. The panel met with municipal leaders, First Nations, community economic development organizations and small businesses in order to: • Examine the potential effect of the retirement of coal-fired generation plants and associated mining operations on communities and workers. • Identify strategies to support worker transition. Panel recommendations were released November 10, 2017.	The panel's engagement meetings helped the panel understand the challenges and opportunities communities and workers are facing to ensure next steps are responsive to concerns and align with community priorities. Albertans and stakeholders were also able to share their feedback through an online survey, which closed May 31 2017 and through town hall meetings with Minister Bilous in August, 2017.
Oil Sands Emissions Limit Implementation	Government is gathering feedback on the Oil Sands Advisory Group's (OSAG) recommendations for implementation of the 100 Mt oil sands emissions limit. The objective of this engagement is to ensure First Nations and Métis peoples in the oil sands region have the knowledge and context needed to express interests and concerns surrounding the Oil Sands Emissions Limit.	There will be two opportunities for communities to take part in this engagement. The first phase is an information-sharing session that will generally introduce current information on oil sands production, a summary of OSAG's recommendations on the Oil Sands Emissions Limit and its potential impact to Indigenous communities. Community members will then have the opportunity to provide feedback on OSAG's recommendations	It is expected that the engagement process will strengthen government's relationship with Indigenous communities and provide government the unique perspectives of Indigenous peoples in Alberta. OSAG specifically recommended that Indigenous communities be consulted on their recommendations. Topics to consider for discussion include: a) how Indigenous communities may be affected should local oil sands

			projects fail to receive regulatory approval due to the proposed limit and b) how Indigenous communities can contribute to research and innovation in existing oil sands operations.
Other Engagement	Grants were provided to Indigenous organizations to increase climate literacy in Indigenous communities, build capacity and expertise in Indigenous organizations, and support opportunity studies for Indigenous communities. As part of the Government's commitment to the UN Declaration of the Rights of Indigenous Peoples, this engagement strategy has been developed to facilitate a collaborative environment for renewed relationships between government and Indigenous communities.	18 grants were provided to Indigenous communities and organizations, including: • 11 grants to provide capacity to Indigenous communities and organizations to participate in the CLP and build climate literacy. • Two grants to support Technical Working Groups comprised of First Nations, Métis and government representatives. • One grant to support a green infrastructure assessment in the Lubicon Lake Band. • Four grants to support opportunity studies for Indigenous communities adversely impacted by the phase out of coal-fired electricity generation in Alberta by 2030. More than 40 regional and community workshops, engaging more than 1,000 Indigenous people, were held across Alberta in Indigenous communities. Issued an online survey and written submission guidebook seeking feedback on opportunities and priorities for Indigenous people in a lower carbon economy. Four meetings have been held with Indigenous leaders to determine a potential joint delivery governance structure for future climate programs.	Active engagement with Indigenous communities, organizations and members in the development of mechanisms devoted both to climate change mitigation and to future work on climate change. Adaptation is a complementary element to the CLP and aligns with the government's commitment to renew and improve its relationship with Indigenous peoples. Engagement activities help ensure climate literacy and awareness is available to all Indigenous communities and organizations to facilitate equal benefit from all opportunities arising from climate initiatives and programs.

3.1 CLIMATE LEADERSHIP ENGAGEMENT ACTIVITIES

Description

Climate Leadership Engagement Activities measures the total number of reported climate leadership engagement events conducted in one year. Engagement information and data are provided to Alberta's Climate Change Office by CLP program leads and aggregated across all programs. Based on descriptions provided by the CLP program leads, data are sorted in five major categories of activities: public messaging, CLP/program feedback, information sessions, consultation sessions and leadership meetings.

Importance

It is important that Albertans have the opportunity to address an issue of such importance as climate change. Benefits of effective public engagement will help support the behavior change required to achieve CLP outcomes. Tracking engagement activities can help identify opportunities to increase their effectiveness.

Target/Desired Result

Maintain or increase.

Progress

In 2016, 163 engagement events/sessions were reported. This does not include the extensive engagement activities conducted by the Climate Change Advisory Panel that helped inform its recommendations in 2015. Preliminary results for 2017 show 135 engagement events through the end of August, on track to meet the year's desired results.

Table SE 3.1 Climate Leadership Engagement Activities

Type	2016	2017 (Preliminary)
Public messaging	9	15
CLP/Program feedback	120	50
Information sessions	8	31
Consultation sessions	24	34
Leadership meetings	2	5
Total	**163**	**135**
Grand Total	**298**	

3.2 CLIMATE LEADERSHIP ENGAGEMENT PARTICIPANTS

Description

Climate Leadership Engagement Participants measures the number of people who participated in various engagement activities within the year. Engagement information and data are provided to Alberta's Climate Change Office by CLP program leads and aggregated across all programs. A household participating in an EEA program is equated to one individual. To align this process with leading practices, the participant's level of engagement is categorized according to IAP2's Public Participation Spectrum:

- Inform: To provide the public with balanced and objective information to understand the problems, alternatives, opportunities and/or solutions related to climate change policy and programs.
- Engage: To obtain feedback on analysis, alternatives and/or decisions related to climate change policy and programs.
- Involve: To work directly with stakeholders to ensure that concerns and aspirations are consistently understood and considered.
- Collaborate: To partner with stakeholders on decisions, including the development of alternatives and the identification of the preferred solution.
- Empower: To place final decision-making in the hands of stakeholders.

Importance

It is important to the success of the CLP that Albertans be actively engaged. Tracking the level of engagement helps assess where there may be gaps, and if the government is engaging at the appropriate level for the specific needs.

Target/Desired Result

Maintain or increase.

Progress

In 2016, more than 24,000 Albertans were engaged at some level in the CLP. This does not include the extensive engagement conducted by the Climate Change Advisory Panel to help inform the CLP's development in 2015. Preliminary results for 2017 show growth of more than seven times, with more than 200,000 CLP-engaged participants.

Table SE 3.2: Climate Leadership Engagement Participants provides a breakdown of the number of participants by IAP2's Public Participation Spectrum levels.

Table SE 3.2 Climate Leadership Engagement Participants

Intent (based on IAPS'2 Public Participation Spectrum)	2016	2017 (Preliminary)
Inform	15,632	42,364
Engage	7,946	145,815
Collaborate	575	7,281
Involve	113	639
Empower	50	75
Total	**24,316**	**196,174**
Grand Total	**220,490**	

SUPPORT AND ENGAGEMENT PROGRAM CONTRIBUTORS

FUNDED IN 2016-17

Primary

- Climate Leadership Consumer Rebates
- Small Business Tax Reduction
- Lloydminster Border Community Competitiveness Program
- Indigenous Engagement and Capacity Building
- Coal-Affected Communities and Workers

ANNOUNCED IN 2017-18
***Preliminary 2017 – Includes programs announced as of August 31, 2017**

Primary

- Alberta Indigenous Climate Capacity Program
- Alberta Indigenous Green Employment Program
- Community Environment Action Grant
- Greenhouse NG Rebate Program

PROGRAM HIGHLIGHTS

26 NGOs receive Community Environment Action Grant

$149 Million Rebated to low and middle income households

220,490 Albertans engaged in CLP engagement activities (2016 to Aug 2017)

2,238 Coal affected community telephone town hall participants

2% Small business tax rate

PROGRAM RESULTS

2016-17 Primary Contributors

Programs/Projects	2016-17		2017-18 Actions/Next Steps	Estimated Cumulative GHG Reductions to 2020 (tonnes)
	Funding	Milestones		
Climate Leadership Consumer Rebates *Alberta is providing rebates to lower and middle-income Albertans to offset the costs associated with the carbon levy. The rebates protect those who spend a higher percentage of their income on energy costs and have fewer financial resources to invest in energy efficiency products.*	$149M	Legislative amendments to allow for rebates to be issued. Rebates issued starting January 2017.	Ongoing issuing of consumer rebate payments on a quarterly basis in January, April, July and October.	*Supports lower and middle-income Alberta households in the transition towards a lower carbon economy.*
Small Business Tax Reduction *Alberta reduced the corporate income tax rate effective January 1, 2017 to help the province's small businesses adjust to the new cost of carbon. The tax reduction will increase Alberta's tax advantage for small businesses.*	$40M	Legislative amendments to allow for tax rate reduction for small businesses. Small business tax rate reduced from 3 per cent to 2 per cent effective January 1, 2017.	Maintain reduced small business tax rate.	*Supports Albertans and Alberta businesses in the transition towards a lower carbon economy.*
Lloydminster Border Community Competitiveness Program *This program provides the Lloydminster Competitive Adjustment Grant to eligible retail fuel dealers in the border city of Lloydminster to cover the difference in total fuel tax and the*	$1M	Funding secured in reserve to be provided to eligible grant applicant. Applicants filing period began (January 2017). Applicants began filing claims for January – March 2017 as of March 31st, 2017.	April 1, 2017 – August 31st, 2017: • 10 Registrants have received funding totaling $1,169, 404. • Includes both payouts for the period of January – March 2017 as well as post April 1st, 2017.	*Supports Alberta in the transition towards a lower carbon economy.*

carbon levy imposed by Alberta, and fuel tax imposed by Saskatchewan on liters of qualifying fuel sold. The grants allow retail fuel dealers to offer fuel prices that compete with Saskatchewan-based retailers within the community.			Ongoing issuing of grants on a monthly basis.	
Indigenous Engagement and Capacity Building *This program provides grants to Indigenous communities to increase knowledge of climate leadership and lower carbon economic opportunities. The program increases awareness of available climate leadership programs and how local actions can be taken to decrease community and organization GHG emissions.*	$2M	17 grants were provided to Indigenous communities and organizations: • 11 grants to provide capacity to participate in the Climate Leadership Plan and build climate literacy. • Two grants to support Technical Working Groups comprised of First Nations, Métis, and government representatives. • Four grants to support opportunity studies for Indigenous communities adversely impacted by the phase-out of coal-fired electricity generated in 2030. More than 40 regional and community workshops, engaging more than 1,000 Indigenous people were held in Indigenous communities.	All program activities were completed in 2016-17.	*Supports Albertans in the transition towards a lower carbon economy.*

		Issued an online survey and written submission guidebook seeking feedback on opportunities and priorities for Indigenous peoples in a lower carbon economy.		
Coal-Affected Communities and Workers Program *Alberta is currently developing a transition plan for the communities and workers impacted by emissions from coal-fired electricity generation being phased out by 2030.*	$356K	Advisory Panel on Coal Communities (APCC) formed to gather information about challenges and opportunities, share information about current programs and generate ideas for training and new opportunities. The APCC has completed its mandate as of September 30, 2017. The report: "Phase-Out of Coal-Fired Emissions: Supporting Impacted Workers and Communities" officially submitted to Government October, 2017. Stakeholder engagement including: • Telephone Town Halls in May, 2017 (2,238 participants). • Minister Town Halls in August, 2017 (326 participants). • Minister meetings with coal community leaders in August, 2017.	Launch of the Coal Community Transition Fund In September, 2017, part of the Community and Regional Economic Support (CARES) program: • Hanna, Alberta awarded $450K through the program to stimulate economic diversification. • Application window open October 1 – November 30, 2017. Economic Development and Trade staff is providing hands-on assistance to coal communities scoping and acting on economic development opportunities.	*Supports Alberta in the transition towards a lower carbon economy.*

Programs Announced in 2017-18 (preliminary as of August 31, 2017)

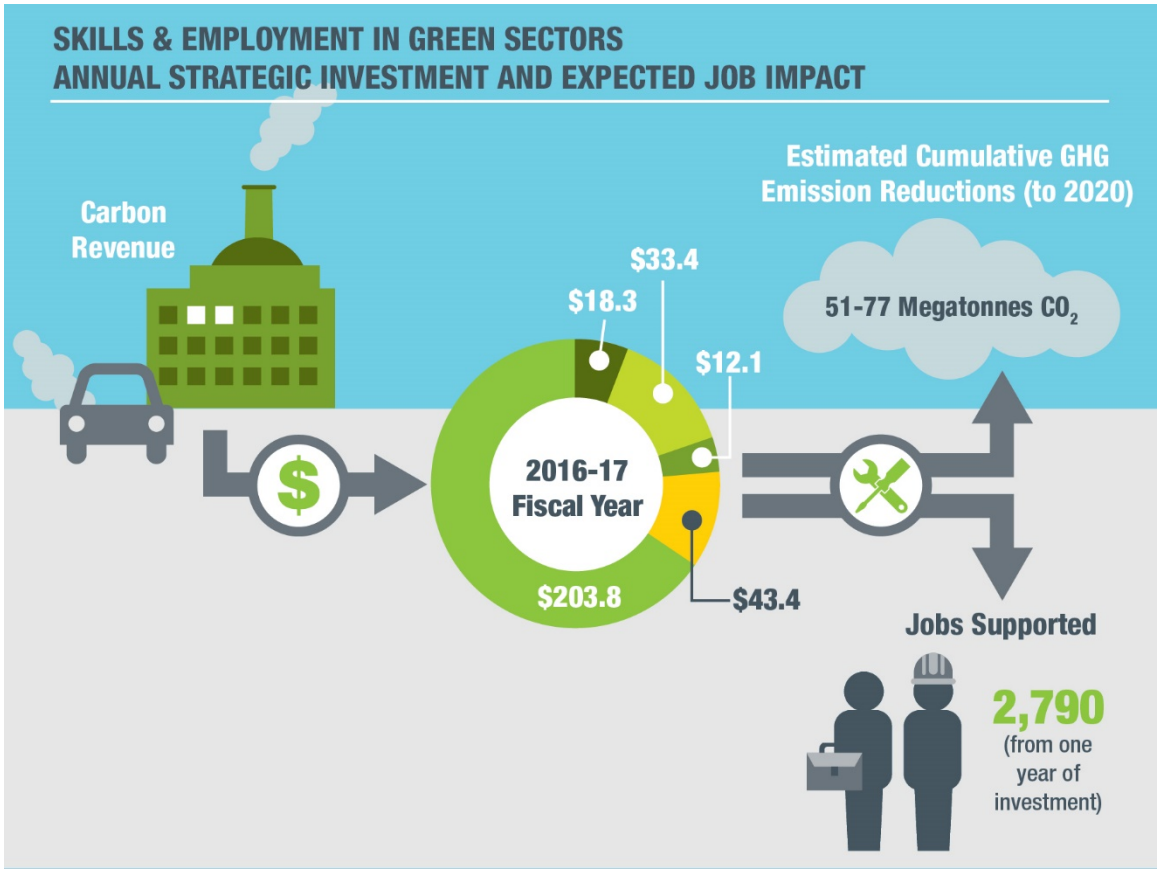
Programs/Projects	Actions/Next Steps	Estimated Cumulative GHG Reductions to 2020 (tonnes)
Alberta Indigenous Climate Capacity Program (AICCP) *This program provides grants to Indigenous communities to increase knowledge of climate leadership and lower carbon economic opportunities.*	Program criteria developed. Program launch (June 2017). Approval of eligible projects. Ongoing support to Indigenous communities.	*Supports Albertans in the transition towards a lower carbon economy.*
Alberta Indigenous Green Employment Program *This program provides grants to train Indigenous people for employment in the green economy. Skills are focused on building, maintaining or participating in innovative ways to reduce GHG emissions and provide Indigenous people with the skills to be employed through Alberta's transition to a lower carbon economy.*	Program criteria developed. Program launch (June 2017). Grants provided to Alberta Aboriginal Skills and Employment Training Strategy (ASETS) agreement holders for eligible projects. Ongoing support to Indigenous communities.	*Supports Albertans in the transition towards a lower carbon economy.*
Community Environment Action Grant *This program provides grants to non-profit groups to design and deliver evidence-based education projects to support Albertans, young and old, rural and urban, to better understand and address climate change.*	Application Round 1: • 62 applications received for grant amount ranging from $25,000 to $150,000 per applicant. Application Round 1: • 26 applications from non-profits selected for grant funding. Subsequent application rounds awaiting funding approval.	*Supports Albertans in the transition towards a lower carbon economy.*

Greenhouse NG Rebate Program *This program provides grants to eligible greenhouse operators equal to 80per cent of the carbon levy paid on their purchase of eligible natural gas and propane crop production related heating within their greenhouses. This program will reduce the impacts on cost competitiveness for greenhouse growers.*	Program development and approvals. Conducted an Online Webinar for Stakeholders. Program launch (July 2017). Application Period 1: • 119 applications submitted. • Applications currently being processed and over half the applicants have received grants. Application Period 2: (January 2018). Application Period 3 (July 2018). Application Period 4 (January 2019).	*Supports Albertans in the transition towards a lower carbon economy.*

SKILLS & EMPLOYMENT IN GREEN SECTORS

The CLP reduces GHG emissions while diversifying our economy and creating jobs. Recycling carbon levy revenue into CLP programs helps stimulate economic growth and provides new opportunities for Albertans to invest and work in green sectors.

The electricity transition from coal to renewables, residential and industrial energy efficiency programs, clean technology research, development and deployment and the construction of green infrastructure are all examples of CLP investments that contribute to diversifying the economy, while at the same time providing opportunities to grow the oil sands sector under the 100 Mt emissions cap. These program investments directly create jobs through implementation and indirectly through supply and access to clean products and services.



The following indicators helps monitor the market demand for environmental skills, knowledge, experience and/or competencies and the impact of CLP investments on supported jobs.

Performance Measures/Indicators	Baseline (2015)	Result (2016)	Target/ Desired Result	6 Year Trend	Status
1. Green Skills					
1.1 Green Skills Demand *(proxy: green job postings as a percentage of job postings in Alberta)*	1.50	1.60	Increasing Trend	▼	●
2. Jobs Supported					
2.1 Alberta Jobs Supported *(total direct, indirect and induced jobs created or maintained as a result of actual CLP investment annually)*	NA	2,799	NA	NA	NA

▲ Positive upward trend ▼ Positive downward trend ▲ Negative upward trend ▼ Negative downward trend

● Projected to meet or surpass target ● Projected to be near target ● Projected to be off target – Steady trend

PROGRESS DETAIL

1.1 GREEN SKILLS DEMAND

Description

Green Skills Demand measures the percentage of job postings that are categorized as green according to CEB Talent Neuron (CEB) definitions and methodology as a proxy for green skills demand. CEB defines green jobs as positions found at some level to be environmentally beneficial. This includes jobs that are purely green in focus, activities and skills (e.g. environmental sustainability planner), jobs that are primarily green in focus, activities and skills, (e.g. solar panel engineer), and jobs that are somewhat green in focus, activities and skills, (e.g. water plant operator).

Green skills demand is measured by extracting jobs postings from CEB's comprehensive database of job advertisements from 198 websites across Canada. Only job postings from known employers were considered.

Importance

As Alberta works towards a lower carbon economy, we can expect to see shifts in the skills required for existing occupations, as well new jobs. Estimating the demand for skills is essential for transitioning to a lower carbon, more diversified economy, as it helps prevent bottlenecks that may occur as a result of skills shortage.

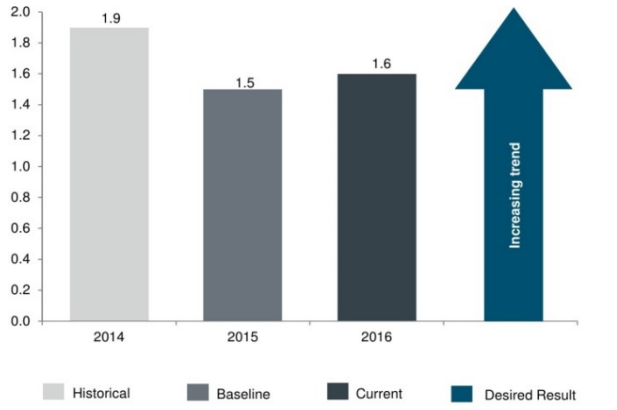
Target/Desired Results

Increasing trend.

Progress

The results show an increase in the percentage of green job postings in the last two years; however green job postings have not yet reached 2014 levels. This result reflects the downturn in the economy that resulted in an overall decrease in job vacancies (approximately 20 per cent decrease in overall job postings from 2014 to 2016). It is expected that as the economy recovers, the recent upward trend will continue as investments grow in lower carbon sectors including renewable energy and energy efficiency.

Figure SJ 1.1: Green Skills Demand (total percentage of green job postings in Alberta)



Data source: Gartner, Inc.

2.1 ALBERTA JOBS SUPPORTED

Description

Alberta Jobs Supported estimates the total direct, indirect and induced jobs created as a result of CLP actual investments in the reporting year. The measure is calculated by Statistics Canada using an input-output (IO) model. Direct jobs are those required to work directly on a project. Indirect are those created as a result of the project, for example new jobs at a firm that provides materials and induced jobs cover those additional jobs that result from the increased household spending. One supported job is equivalent to one person-year job, that is, one year of employment for an individual. Actual 2016-17 expenditures categorized by associated North American Industry Classification System codes for each of the CLP programs was provided to Statistics Canada by the Alberta Climate Change Office for use in the IO model.

Importance

The CLP moves Alberta towards a lower carbon economy. At the same time, CLP policies and investments provide additional benefits by boosting economic activity, increasing gross domestic product and supporting new jobs. Monitoring the number of jobs supported by CLP program investments using a common methodology and comparing results over time will help assess its effectiveness.

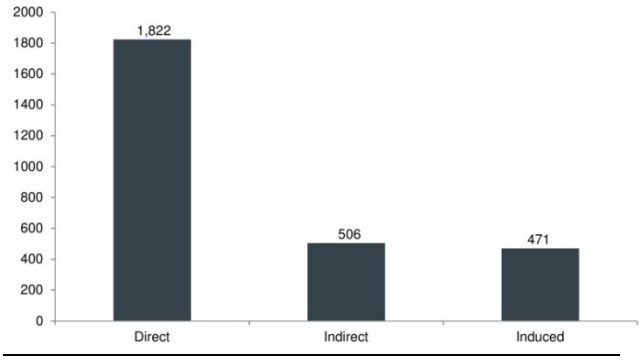
Target/Desired Result

NA.

Progress

In 2016-17, $311 million was invested back into the economy in programs and policies designed to reduce GHG emissions, support a lower carbon diversified economy and to support Albertans through this transition. This investment supported more than 2700 jobs. This is expected to increase as investment increases; and as many of the projects move into the implementation stages, increasing demand for construction-related jobs and then operational jobs.

Figure SJ 2.1: Alberta Jobs Supports (total number of direct, indirect and induced jobs for 2016)



Data source: Statistics Canada

WHAT'S NEXT

The Climate Leadership Plan is a vision for Alberta's future. And while it has already accomplished a great deal major milestones still lie ahead. In 2018, for example, the Government will bring forward regulations that fulfill its promise to limit emissions from the oil sands at 100 megatonnes.

Another milestone is the recent release of a formal framework for a carbon competitiveness incentive system, which improves upon the Specified Gas Emitters Regulatory system that applied to large industrial emitters. It rewards those with the best technology and systems, and protecting the competitiveness of Alberta's carbon-intensive and trade-exposed sectors. It will be covered in future reports.

In order to make sure Alberta is getting to that destination – and getting there in the most efficient and effective way possible – the government will continue to report publicly on its progress.

Alberta's journey down the road towards a cleaner and greener future is underway, guided by the Climate Leadership Plan.

APPENDIX

METHODOLOGY

Forecasted GHG Emissions for Alberta (Ultimate Outcome - Reduced Greenhouse Gas Emissions)

In collaboration with Navius Research Inc., the Alberta Climate Change Office (ACCO) has undertaken sector and economy-wide assessments of economic and environmental (GHG) impacts using an environmental integrated economic model. The economic model is a technology-rich computable general equilibrium model built by Navius Research Inc. and operated by ACCO staff. The model is built on Statistics Canada input-output tables (with some adjustments) with 2010 as a base year, and is calibrated to Environment and Climate Change Canada National Inventory Reports and internal Government of Alberta forecasts of energy production and economic activity. ACCO staff work continuously to improve the method used to forecast the impacts of policy scenarios and the resulting emission levels.

Strategic Investments

- **Investment $**

Investments are actual 2016-17 expenditures.

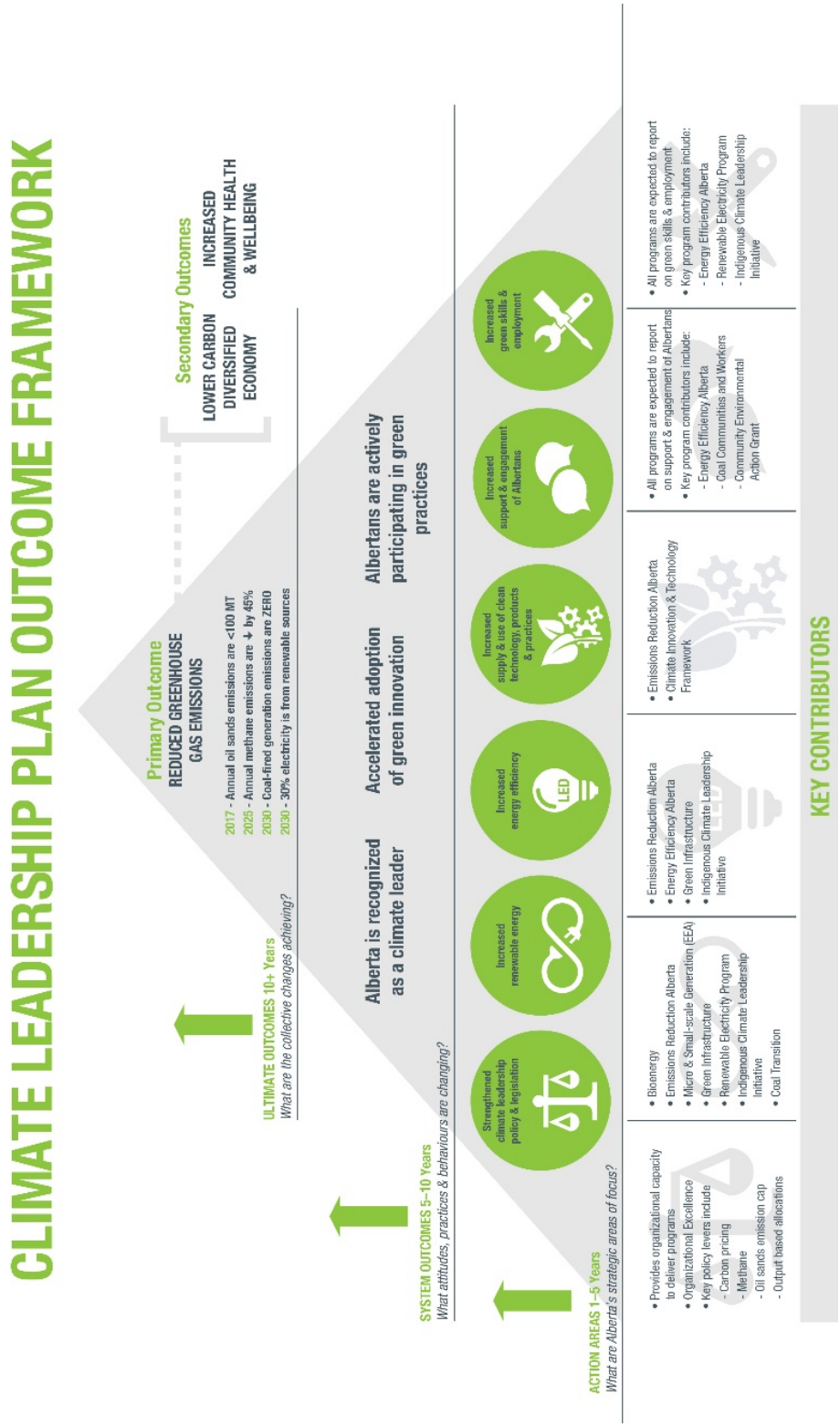
- **Expected Job Impact**

Jobs Supported is an estimate of the number of jobs that will be supported as a result of the one-year investment. The estimates are calculated by Statistics Canada using input-output models for 2016-17 actual spending as described in Green Skills and Employment, 2.1 Alberta Jobs Supported. Jobs have been rounded to the tens in the strategic investment infographic.

- **Expected Impact of Investment – Cumulative GHG Emissions Reductions to 2020**

Cumulative GHG emissions reductions to 2020 are estimated based on what is expected to occur as a result of the one year of spending with results cumulated from 2017 to 2020 inclusive. Policy and legislation emissions reductions are estimated using the Navius model described above. All other action area estimates are calculated based on an aggregate of estimated cumulative reductions from programs that received funding in 2016-17.

CLP OUTCOME FRAMEWORK



INDEX OF CLP PROGRAMS AND INITIATIVES (IN ALPHABETICAL ORDER)

A

Accelerating Agriculture Innovation Program, 58

Alberta Carbon Capture and Storage Program (CCS), 82

Alberta Carbon Conversion Technology Centre, 83

Alberta Indigenous Climate Capacity Program (AICCP), 102

Alberta Indigenous Climate Planning Program (AICPP), 63

Alberta Indigenous Community Energy Program (AICEP), 57

Alberta Indigenous Green Employment Program, 102

Alberta Indigenous Green Energy Development Program, 43

Alberta Indigenous Energy Efficiency Program (AIEEP), 63

Alberta Indigenous Solar Program (AISP), 39

Alberta Municipal Solar Program, 42

B

Bioenergy Producer Program, 39

Business, Non-Profit and Institutional (BNI) Energy Savings Program, 62

C

Carbon Competitiveness Incentives (CCIs), 26

Carbon Pricing, 26

Climate Change Innovation Technology Framework, 82

Climate Leadership Consumer Rebates, 99

Coal Affected Communities and Workers, 101

Coal Transition, 39

Community Environment Action Grant, 102

E

Emissions Reduction Alberta Grant, 41, 80

Energy Efficiency Infrastructure Projects, 59

G

Greenhouse NG Rebate Program, 103

Green Transit Incentives Program (GreenTRIP), 84

Green Transportation Impact Studies, 81

I

Indigenous Engagement and Capacity Building, 100

Irrigation Efficiency Program, 58

L

LED Provincial Highway Lighting Program, 58

Lloydminster Border Community Competitiveness Program, 99

LRT – Calgary Green Line, 83

LRT – Edmonton Southeast Valley Line Phase 1, 83

M

Methane Reduction, 26

Micro- and Community Energy Generation, 27

N

Non-Profit Energy Efficiency Transition (NEET) Program, 62

O

Oil Sands Emissions Cap, 26

On-Farm Energy Management Program, 58

On-Farm Solar Photovoltaic Program, 40

R

Regulated Rate Option Price Ceiling, 43

Renewable Electricity Program, 43

Renewable Energy Infrastructure Projects, 40

Residential and Commercial Solar Program, 41, 62

Residential No-Charge Energy Savings Program (RNCESP), 56

Residential Retail Products Program, 56

S

Small Business Tax Reduction, 99

Solar Technology Initiative, 42

Start Energy Efficiency Alberta Agency, 56

T

Taking Action to Manage Energy (TAME) Express Pilot Program, 61

Taking Action to Manage Energy (TAME+) Program, 61

Prairie Resilience:

A Made-in-Saskatchewan Climate Change Strategy

Saskatchewan.ca

Government of Saskatchewan

Prairie Resilience:

A Made-in-Saskatchewan Climate Change Strategy

Introduction

Saskatchewan people are pragmatic, resourceful, innovative.

Throughout our history, we have faced complex, challenging problems imposed on us by geography and climate. Our population spread over a vast land has taught us self- reliance and resilience.

We've learned when we are faced with a challenge, it is up to us to solve it.

Today, we face the global challenge of climate change, and once again our province is motivated to develop an effective response. Our industries are heavily dependent on fossil fuels to produce energy, food, fertilizer, products and commodities needed around the world.

It's up to us to come up with made-in-Saskatchewan solutions that encourage action to meet the challenges posed by climate change.

When faced with a complex problem, there is a temptation to reach for the simple, quick answer. Climate change is such a problem.

We wholeheartedly support efforts to reduce greenhouse gases. But those efforts must be effective and they must not disadvantage one region of Canada more than another. A federal carbon tax is ineffective and will impair Saskatchewan's ability to respond to climate change.

Our opposition to the federal government's carbon tax should not be seen as a reluctance to act. Rather, it is a recognition that we must act, and act decisively, with all our economic strength. For Saskatchewan, mitigation is not enough. Our agriculture and resource-rich province must also focus on climate adaptation and resilience in order to be effective.

A strong economy is one with the resilience and resources to seek solutions and fund the innovations that we simply must have to respond effectively to climate change.

We propose a broad and comprehensive approach, one that connects the very real global problem of climate change to the day-to-day priorities of people. An approach that sets out actions people can see and be a part of. An approach that allows Saskatchewan to continue to grow and prosper while contributing to Canada's efforts to address climate change.

Saskatchewan people and businesses have already begun this monumental task. Their actions range from world-leading innovation and technology development in agriculture and power generation, to community and infrastructure developments that continue to strengthen the resilience of our economy and the integrity of our environment.

In this strategy, the Government of Saskatchewan builds upon actions we have already taken and introduces measures to strengthen our province and build resilience to climate change. Our plan is bold, broad and made for Saskatchewan. It is the best way for our province to harness our valuable resources while contributing solutions to an issue that affects the entire world.

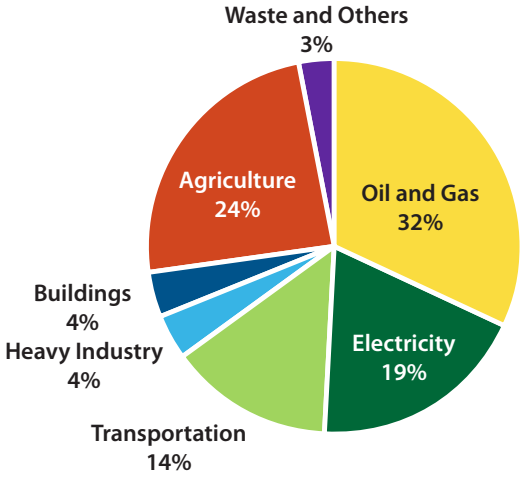
How did we get here?

Saskatchewan has a demonstrated, long-standing commitment to action on climate change.

Between 2008 – 2015, the Government of Saskatchewan invested $60 million in GoGreen funding through public-private partnerships to reduce greenhouse gas emissions, enhance biodiversity and educate the public about the effects of climate change.

Saskatchewan continues to be a leader in technologies and knowledge about carbon capture use and storage (CCUS). We have applied that expertise to our provincial electricity generation system since 2014, further reducing our emissions by more than 1.75 million tonnes of carbon – the equivalent of taking 440,000 cars off our roads.

Saskatchewan's GHG Emissions by Economic Sectors (2015)



Sask Total (2015) = 75.0 Mt CO_2e

Sources: Canada's *National Inventory Report* 1990-2015 (2017)

In 2015, our provincial utility, SaskPower, set a target of doubling its percentage of electricity capacity from renewable energy sources. The ultimate goal is to get 50 per cent of our power from renewables by the year 2030.

In December 2015, Canada signed the Paris Agreement on climate change. This was the biggest international commitment on this issue since the Kyoto Protocol 20 years earlier. It is even more significant because of the full inclusion and commitment of developing nations.

Under the Paris Agreement, Canada committed to reducing greenhouse gas emissions by 30 per cent below 2005 levels by the year 2030.

In March 2016, Canada's leaders from the federal, provincial and territorial governments gathered in Vancouver to discuss next steps, culminating in the signing of the Vancouver Declaration on Clean Growth and Climate Change by all partners including Saskatchewan.

Saskatchewan did not sign the subsequent Pan-Canadian Framework on Clean Growth and Climate Change, in large part because the Framework promotes a carbon tax as the central approach to reducing emissions. A carbon tax would not significantly reduce emissions in our province where our economy and geography don't allow for easy alternatives. In fact, a carbon tax would make it more difficult for our province to respond effectively to climate change because a simple tax will not result in the innovations required to actually reduce emissions. We believe the challenges we face are complex and will not yield to simple measures.

The conversation about climate change must be broader than carbon pricing. It must encompass how we as Canadians prepare, mitigate and adapt.

A note on greenhouse gases

Much of the discussion on greenhouse gases centres on carbon dioxide, or CO_2. This is often shortened further to simply, "carbon." However, there are other important greenhouse gases such as methane (CH_4) from the petroleum industry, livestock and landfills as well as nitrous oxide (N_2O) from agricultural fertilizers.

To avoid confusion, the term "carbon dioxide equivalent" or "CO_2e" has been used throughout this strategy. Quantity is given in megatonnes or "Mt." Canada produces about 722 Mt per year, about two per cent of the global total. Saskatchewan produces about 10 per cent of Canada's greenhouse gas emissions or 75 Mt per year.

Resilience is the ability to cope with, adapt to and recover from stress and change.

Nevertheless, the Government of Canada announced a carbon tax of $10 per tonne to be introduced by 2018, rising $10 per tonne annually to $50 per tonne in 2022. Provinces that don't introduce a tax of their own are expected to have a tax imposed upon them by the federal government. This 'backstop' consists of a carbon tax on the combustion of fossil fuels and an output-based pricing system on industrial facilities.

Money generated from this federal backstop is to be returned to the province, but the mechanism for this has not yet been explained.

The Government of Saskatchewan continues to be committed to action on climate change. We set out our position in October 2016 with the release of the Climate Change White Paper which recommends that we:

- *Capture unrealized value from agricultural and non-renewable resource sectors.*
- *Elevate the importance of adaptation in the provincial and national conversation about climate change.*
- *Improve the profile and accounting of carbon sequestration.*
- *Get credit for the international transfer of knowledge.*
- *Develop regulations for the flaring and venting of methane.*
- *Expand use of renewables by SaskPower in electricity generation.*

The White Paper makes clear that our province's ability to adopt lower-carbon technology and innovation as well as adapt to climate change are critical to building the resilience Saskatchewan must have to respond to climate change.

What is Saskatchewan's approach to climate change?

Resilience is key to Saskatchewan's approach to climate change. Resilience is the ability to cope with, adapt to and recover from stress and change. This is essential, as some effects of climate change are already underway and unavoidable.

Resilience is a much stronger indicator of effective climate action than simply measuring reductions in greenhouse gas emissions, because it measures our overall ability to adapt, innovate and even thrive.

Focusing on resilience will yield a stronger approach for Saskatchewan – a growing agricultural and resource-based economy not only rising to the challenge, but providing leadership through forward-looking policy change.

Saskatchewan has strong motivation to seek solutions. We have recently endured many varied and costly climate-related events and are acutely aware of our exposure to changing climate because the land is integral to our economy. Our province is expected to experience more extreme weather events, including an increase in the severity and frequency of droughts and flooding, and more intense forest fires[1,2]. For Saskatchewan, climate change resilience is critical.

Multiple systems need to be strengthened to improve the resilience of the province as a whole. This includes the ability of Saskatchewan's natural systems (including our land, water, and forests), infrastructure, communities and economy to adapt and thrive in a changing, low-carbon economy.

What steps will Saskatchewan take?

Critical to a resilience strategy is identifying efforts that can be undertaken within specific areas of focus. The province has developed climate resilience policies in several areas, including: natural systems, physical infrastructure, economic sustainability and community preparedness. These policies cover the ways climate change is affecting Saskatchewan. Although many policies have implications for more than one area of focus, they are identified under the area of best fit.

NATURAL SYSTEMS

The Government of Saskatchewan is committed to stewardship and responsible development of our province's remarkable abundance of natural resources. How we grow our crops, harvest our forests and protect our vital water systems will be critically important to how we prepare, respond and adapt to a changing climate.

In agriculture, the province is a global leader in low-emissions practices. Our soils are an important carbon sink, sequestering carbon dioxide from the atmosphere. Since the 1980s, our growers have been developing, refining and implementing zero- and low-tillage practices, increasing the ability of our soils

[1] *Wheaton, E., B. Bonsal, V. Wittrock. 2013. Future Possible Dry and Wet Extremes in Saskatchewan, Canada. Prepared for the Water Security Agency, SK. 35 p. SRC Pub #13462-1E13.*

[2] *Parisien, M.-A.; Kafka, V.; Flynn, N.; Hirsch, K.G.; Todd, J.B.; Flannigan, M.D. 2005. Fire behavior potential in central Saskatchewan under predicted climate change. PARC (Prairie Adaptation Research Collaborative), Regina, Saskatchewan. 12 p. PARC Summary Document 05-01.*

Government of Saskatchewan

to sequester carbon. Farmers have diversified their crops to enhance soil health and manage pests and diseases. Producers are implementing 4R nutrient stewardship to enhance fertilizer efficiency and adopting new crop varieties that are more drought resistant. Producers also implement grazing rotations, and adopt beneficial management practices such as seeding marginal land to grass. These actions can enhance yield, improve carbon sequestration and fortify the climate resilience of their operations.

Current tillage practices sequester about 9 Mt of CO_2e in our soils annually. Saskatchewan's commercial forests store an estimated 3.5 Mt of CO_2e every year. Increased innovation, stimulated by an offset system, could drive carbon sequestration even further.

Crop selection can also have an impact. Planting more nitrogen-fixing crops such as lentils and other pulses could reduce emissions beyond the 2 Mt CO_2e currently being sequestered annually. Pulse crops, for example, have increased from 400,000 acres in 1990 to more than seven million acres in 2017.

Agriculture also offers other opportunities to develop co-products from production that would otherwise go to waste. For example, six to eight per cent of Saskatchewan's canola crop is too damaged to be used as a food ingredient, but this resource is being used by innovative companies to produce biodiesel.

Another example is the Livestock and Forage Centre of Excellence at the University of Saskatchewan. Researchers there are developing different processing, local crops and feedstock compositions that reduce methane as well as use crop co-products that would otherwise have little value.

Innovation in agricultural and forestry management practices needs to be recognized.

For many decades, Saskatchewan has actively managed and regulated its public and commercial forests – another important carbon sink. Forest resilience is a priority, helped along by initiatives such as the forest-assisted migration project, under which five million Jack pine seedlings have been planted since 2013. These efforts add to routine replanting programs that occur as part of normal forestry operations.

Lumber from Saskatchewan forests is used both in our province and in export markets to build thousands of homes and other durable structures.

Innovation in agricultural and forest management practices could further increase the amount of CO_2e removed from the atmosphere and stored in our soils and forests. This valuable contribution needs to be recognized.

Safeguarding the health of our water systems is another critical element in responding to climate change. How we use our lands and our actions to preserve and restore wetlands builds resilience into our landscapes through greater ability to retain carbon and reduce the effects of flood and drought. Our water strategy assesses past drought events, identifies where floods are most likely to happen and how severe they might be, and conducts continued assessment of water resources. This knowledge guides planning for infrastructure such as roads and highways as well as land use policies.

These are a few of the ways Saskatchewan businesses and researchers are demonstrating the resilience our province draws upon to meet challenges such as those posed by climate change.

It's important that Canada and its partner nations in the Paris Agreement develop accounting systems to credit past and future land use and management decisions that help sequester carbon.

The Government of Saskatchewan is committed to the health of our landscapes and continues to support initiatives in agriculture, forestry and water security.

We will:

- *Develop and implement an offset system that creates additional value for actions that result in carbon sequestration or reduced emissions, especially from our soils and forests.*
- *Ensure natural and commercially forested lands are managed in a manner that enhances the removal and storage of carbon from the atmosphere while allowing for sustainable harvesting, respecting normal forest cycles and fire preparedness.*

- *Maintain or restore landscape integrity to optimize ecological goods and services, enhance resilience to extreme weather events and manage the risk to biodiversity.*
- *Increase our understanding of future climate trends and adaptation options to address impacts that extreme weather events such as flooding and droughts could have on future water supplies.*
- *Advance options to improve Saskatchewan's ability to measure stream flows and provide flow forecasts to aid in adapting to the potential effects of climate change on watersheds and infrastructure operations.*
- *Continue to implement Saskatchewan's agricultural water management framework in the province to help assure continued productivity, enhance wetland habitat conservation and improve runoff management in times of both drought and flood.*
- *Advance options to focus on permanent flood damage reduction and flood mitigation projects and thereby increase resiliency of flood prone areas.*
- *Continue to improve the condition and resilience of provincially owned dams and water infrastructure.*
- *Commit, in partnership across Canada, to help develop a pathway to achieve Canada's Target 1 and establish a coordinated network of parks and conservation areas throughout Canada that will serve as the cornerstone for biodiversity conservation for generations to come.*

PHYSICAL INFRASTRUCTURE

Physical infrastructure is how we shelter ourselves, produce and move goods and manage the built environment. Our infrastructure needs to perform in ways that enable lower carbon emissions. Building infrastructure more resilient to climate change means moving to more fuel-efficient vehicles, machinery and transportation options, cutting our reliance on greenhouse gas-emitting electricity generation and building more energy-efficient buildings.

Saskatchewan has deep, established expertise in these areas. Our researchers developed the building techniques and technologies now codified in Canada's R2000 standard for energy-efficient homes. These energy-saving technologies are used not only in homes, but in commercial, industrial and public facilities. They continue to be improved through research partnerships with Saskatchewan post-secondary institutions – an activity that also trains professionals to work in these green industries.

Saskatchewan is a pioneer in developing world-leading technologies to save energy.

Electricity

The province has made significant investment in reducing electricity emissions through development and installation of the world's first major post-combustion carbon capture use and storage (CCUS) facility at Boundary Dam Unit 3. Carbon captured using this technology can be permanently sequestered underground, whether in deep saline formations or by using it to enhance oil recovery.

CCUS technology could be applied to reduce global electricity sector emissions and has the potential for uses in other high-carbon-emission sectors such as steel and concrete production.

SaskPower has committed to reducing emissions, in part through the expansion of renewable energy sources up to 50 per cent of generating capacity. To maximize the benefits of these renewable sources, energy storage, including batteries, is needed to help meet the ups and downs of electricity demand. Saskatchewan researchers at the Canadian Light Source

national synchrotron facility are already at work on cutting-edge energy storage technologies.

Another way to reduce emissions is to modernize the electricity grid to integrate more renewable energy.

An equivalency agreement with the federal government on electricity sector emissions from conventional coal-fired electrical generation in Saskatchewan will enable SaskPower to manage reduction of its greenhouse gas emissions across its entire fleet rather than on a unit-by-unit basis. This agreement will give SaskPower increased flexibility in operating its existing coal units, helping to maintain low rates

for SaskPower customers. At the same time, SaskPower will be able to focus investment into lower emitting and renewable energy projects and agreements. These will play a key role in enabling SaskPower to achieve greenhouse gas emission reduction targets.

Actions taken on electricity generation will result in a 40 per cent annual reduction in greenhouse gas emissions from 2005 levels by 2030, representing a reduction of about 6 Mt of CO_2e.

We will:

- *Introduce regulations governing emissions from electricity generation by SaskPower and Independent Power Producers.*
- *Meet the province's commitment of up to 50 per cent electricity capacity from renewables, through:*
  - *Increasing renewable energy sources, including wind and solar*
  - *Investigating the feasibility of energy storage services to expand renewables capacity*
  - *Updating the provincial electricity dispatch method with emissions criteria to support reduced emissions.*
- *Explore additional energy efficiency and conservation products and services to support emission reduction targets.*
- *Determine the viability of extending carbon capture use and storage technology to remaining coal power plants while continuing to work with partners on the potential application for CCUS technology globally.*

Transportation and Related Infrastructure

Saskatchewan is a trading province, producing fuel, food, fertilizer, products and commodities for consumers in markets around the world. Supporting this trade is an extensive transportation network including rail lines and roads.

Our highways are a connecting network for all other critical infrastructure and communities, helping increase Saskatchewan's resilience in overcoming climate emergencies. All-weather roads support access to northern communities and require attention as the climate changes.

This is critical infrastructure, vulnerable to climate change. Extreme weather events and longer-term climate changes cause floods that overwhelm culverts, wash out roads and destroy property.

Saskatchewan has responded with:

- Improved design of highway systems to reduce the amount of maintenance and repairs needed
- Improved culvert design to protect against events such as spring ice flow damage
- Longer culvert lengths where failures are more likely to occur during flood events
- Increased documentation of water levels at culvert crossings during floods to provide historic water level information to support new culvert designs

In one industry example, companies participate in the SmartWay Transport Partnership. This voluntary public-private collaboration aims to reduce fuel costs and improve environmental performance in the transportation industry. It does this by providing a system to measure, benchmark and share information about fuel use and freight emissions. In

doing so, companies are able to review and improve logistics operations while reducing their carbon footprint.

Although our road and rail network is vital to Saskatchewan's economy, it produces a significant portion of our greenhouse gas emissions. We are committed to working towards greater efficiency and lower emissions with our own government fleet and in partnership with the transportation industry.

We will:

- *Monitor the highway system for vulnerabilities that could impact human health, property and transportation efficiency to help prioritize preventative maintenance and redesign.*
- *Create a freight strategy to improve delivery times, reduce fuel use, and increase efficiency.*
- *Increase the use of idle time limiters in government trucks to reduce fuel usage.*
- *Evaluate government fleet vehicles for lower-carbon technology opportunities.*
- *Continue to support industry in expanding the size and usage of the short haul (short line) rail systems.*
- *Expand the Trucking Partnership Program to increase fuel efficiency in freight hauling.*
- *Facilitate traffic data specific to Saskatchewan to mitigate emissions from congestion and idling.*

Although exact total emission reductions are not yet counted, the benefits are clear. For example, current government-industry partnerships have already resulted in an estimated annual reduction of 50,000 tonnes of CO_2e per year.

Homes and Buildings

The Government of Saskatchewan is committed to reducing the life cycle costs of new buildings and improving the energy efficiency of existing buildings to match the demands of geography, climate and conditions specific to Saskatchewan.

We continue to show leadership by enhancing energy efficiency and conserving energy use in and around government buildings. For example, in 2016-2017, eight government buildings in Saskatchewan received BOMA BEST certification, bringing the total number of certified government buildings to 47. This independent national certification for buildings recognizes excellence in energy and environmental management and performance.

We will:

- *Adopt the 2015 National Building Code, effective January 1, 2018, with provisions that improve energy efficiency standards for houses and small buildings taking effect January 1, 2019.*
- *Adopt the 2015 National Energy Code for Buildings, applicable to large buildings effective January 1, 2019.*
- *Facilitate provisions in the 2015 National Building Code that provide for increased use of wood in building construction in order to extend carbon storage.*
- *Explore options to label buildings for energy performance.*
- *Encourage industry to further develop innovative solutions to meet energy performance requirements.*
- *Increase the number of government buildings with a sustainability certification.*
- *Require new and renovated government buildings to exceed the energy performance requirements of the 2015 National Energy Code for Buildings by ten percent.*
- *Work with other provincial and territorial governments in collaboration with the National Research Council to improve standards for climate resilience in building design.*

ECONOMIC SUSTAINABILITY

Economic sustainability is our ability to remain competitive in a global marketplace, encourage investment and maintain or increase personal economic well-being. It's also our ability to balance economic growth and industrial competitiveness with our commitment to reducing greenhouse gas emissions.

We will recognize and reward companies that take the lead in reducing carbon emissions.

This includes ensuring our businesses and industries enjoy the support they need to develop marketable innovations to address climate change. Federal and provincial policies must work in concert to ensure Saskatchewan continues to be a preferred jurisdiction for investment.

Large Industrial Emitters

Large industrial sectors such as mining and manufacturing contribute significantly to Saskatchewan's greenhouse gas emissions. Saskatchewan's large emitters produce 6 Mt of CO_2e every year. (Note: upstream oil and gas, and electricity industries are addressed elsewhere in this strategy since they are regulated separately). These industries continually improve operations to meet international standards while remaining competitive in a global marketplace.

Bringing in provincial performance standards encourages industry to further reduce emissions. These standards are most effective when accompanied by policies that recognize and reward companies that choose to take the lead. By stipulating a carbon intensity threshold, the approach rewards performance and early action.

This approach doesn't put a cap on total industrial emissions, which could inhibit provincial economic development and growth. Instead, our approach encourages and engages Saskatchewan's industry to produce innovative solutions that can reduce the intensity of our emissions and, at the same time, stimulate provincial economic development and growth.

We will:

- *Implement sector-specific output-based performance standards on facilities emitting more than 25,000 tonnes of CO_2e per year.*
- *Obligate facilities that annually emit more than the regulated performance standard to take compliance actions. Flexible compliance options will allow these facilities to meet their obligations in the way best suited to their business models through:*
    - *Making improvements at their facility to reduce emissions intensity.*
    - *Purchasing an offset, representing a reduction in greenhouse gas emissions made by a non-regulated entity (e.g., in agriculture, forestry or other approved offset protocol).*
    - *Using best performance credits, which will be generated by a regulated facility reducing emissions beyond what is required in the performance standard. Best performance credits could also be purchased from another entity, from another facility.*
    - *Engaging in the market mechanisms outlined in the Paris Agreement, specifically internationally transferred mitigation outcomes (ITMOs).*
    - *Paying into the provincial technology fund.*

Technology and Innovation

A technology fund is one way regulated emitters can comply with their sector's performance standard. If they are unable to meet their sector-specific target through on-site actions, offsets, best performance credits or other approved mechanisms (such as those adopted from the Paris Agreement) they could make up the difference by paying into a technology fund.

The Government of Saskatchewan will use the technology fund to invest in industrial innovation. The aim is to stimulate and drive innovation to bring down greenhouse gas emissions while providing transformative technologies and strategies to strengthen our resilience to climate change.

We will:

- *Enact a provincial technology fund as a compliance mechanism to further enable investment in transformative technologies and innovation.*

Upstream Oil and Gas Industry

Saskatchewan will develop and pass greenhouse gas emissions regulations specifically suited to our upstream oil and gas industry. These will include reporting requirements and emission reduction targets.

Regulations tailored to Saskatchewan producers need appropriate timing and flexibility in terms of investments in emission reduction technologies.

Methane from petroleum operations is often burned (flared) or vented into the atmosphere, producing the largest source of greenhouse gas emissions from this industry sector. To address this, policies will be explored aimed at creating market demand for this potential resource.

These measures are expected to reduce greenhouse gas emissions from Saskatchewan's upstream oil and gas industry by 40 to 45 per cent of 2015 levels or between 4 and 4.5Mt of CO_2e.

We will:

- *In consultation with the oil and gas industry, develop regulations to reduce greenhouse gas emissions from oil and gas wells and facilities using a results-based system that:*
  - *Provides each oil and gas operator the ability to efficiently prioritize emission reduction investments*
  - *Supports adoption of innovative emissions reduction technologies*
  - *Firmly establishes provincial regulatory oversight of emissions from the oil and gas industry*
  - *Includes a strategy to support the increased use of methane produced in association with oil for heating and electricity production, including the establishment of usage requirements for this source of natural gas.*

COMMUNITY PREPAREDNESS

Our province is one of strong community and family bonds. As extreme weather events become more unpredictable, frequent and intense, the resilience of Saskatchewan's communities will be vital to their security and growth. This resilience will come both from individuals and their communities.

This strategy aims to protect our environment for everyone's benefit and enjoyment, while ensuring people are protected from extreme weather events such as floods and wildfires. It will also support people's livelihoods, helping ensure they have stable jobs to provide for their families.

We will foster people's capacity to take advantage of new opportunities.

The Government of Saskatchewan's relationship with First Nations and Métis peoples is critical to success in the face of climate change. As many of these citizens live in rural and remote communities, they are particularly vulnerable to the effects of climate change, such as increased forest fires. Importantly, they are also keepers of deep traditional knowledge that can help us all prepare and adapt.

Individual communities also help to reduce greenhouse gas emissions by managing landfill, waste, and sewage facilities.

A strong provincial resiliency plan must ensure the continued well-being of its citizens. We will foster people's capacity to take advantage of new and changing opportunities. This means continued efforts to attract, train, and retain qualified people for future job growth in diverse and emerging industries.

We will:

- *Examine current floodplain mapping to identify local communities at greatest risk of flooding, fire, and extreme weather events.*
- *Encourage family preparedness plans, by making emergency preparedness guides and suggested emergency kit content lists available through Saskatchewan and local government websites.*
- *Maintain and enhance partnerships with First Nations and Métis communities to address and adapt to a changing climate through actions that are guided by traditional ecological knowledge.*
- *Encourage communities to develop appropriate plans and preparedness to respond and recover from extreme weather events.*
- *Encourage municipalities to consider disaster mitigation projects a priority when applying for infrastructure funding.*
- *Promote the upgrading of municipal waste and sewage management services to reduce, capture and use GHG emissions and biogas that would otherwise be released into the air, by making these projects a priority category for support under joint federal/provincial funding programs.*

MEASURING, MONITORING, AND REPORTING

Industry Reporting

All climate change policies need a regulatory system for measuring, monitoring, and reporting greenhouse gas emissions.

In Saskatchewan, facilities that emit more than 50,000 tonnes of CO_2e every year are already reporting to the federal government. We will modify this to include smaller emitters and introduce voluntary reporting to supplement this measure. This will give us a more detailed picture and better understanding of Saskatchewan's greenhouse gas sources.

Saskatchewan's publicly traded companies can move to the cutting edge of accounting and investor confidence through climate-related financial disclosures. These types of disclosures help investors to know how a company may be at risk due to climate change, how it is preparing to mitigate those risks, and what actions it is taking to make their business more resilient to climate change. In future, markets are likely to respond better to companies that show how they are reducing emissions through their supply chain and efficiency choices.

This novel approach can help strengthen Saskatchewan's reputation as a forward-thinking player in the global economy.

We will:

- *Develop annual reporting regulations for industry that apply to:*
  - *All emitters of more than 25,000 tonnes of CO_2e annually*
  - *A voluntary opt-in for emitters over 10,000 tonnes of CO_2e annually.*
- *Explore options for tracking the import and export of emissions.*
- *In conjunction with the business community and the Canadian Securities Administrators, develop a draft guidance document to require climate-related financial disclosures by publicly-traded companies based in Saskatchewan.*

Government Reporting

We are committed to tracking and reporting on our progress. We will provide an overall integrated score against a transparent, easily understood target. This will let people know how we are progressing in building our resilience to anticipated challenges from a changing climate. Progress will be reported annually and targets adjusted periodically (e.g., every five years) as we learn more about the effects of climate change.

This approach will give us a much more comprehensive picture of our resilience to climate change than simply measuring whether total greenhouse gas emissions are up or down. Our approach will show us what effects climate change is having on our people and our economy, and how our efforts are building resilience.

The specifics of our plan to meet the challenges of climate change will be developed over the next several months. This will include clearly defined measurement areas, including how much weight each one carries in our assessment.

We will:

- *Track and report across all areas of focus to convey progress in making our province more resilient to climate change.*
- *Report to the national and international community, through Canada's annual submission to the United Nations Framework Convention on Climate Change, on how Saskatchewan's actions are impacting greenhouse gas emissions and mitigating the effects of climate change.*

The table on the following page shows the kinds of things we could measure to get a better picture of our resilience. Note the examples of specific determinants are for illustrative purposes only.

Model of Saskatchewan Resilience Measure				
Areas	**Examples of Specific Measures**	**Weighting**	**Resilience Score**	**Resilience Target**
Natural Systems	Percentage of cultivated land managed under zero/low-tillage practices Amount of sequestered carbon generating offsets	tbd	tbd	tbd
Physical Infrastructure	Percentage of storm water systems constructed to accommodate more extreme precipitation events GHG emissions / MWh of electricity produced	tbd	tbd	tbd
Economic Sustainability	Quantity of GHG emissions from industrial facilities captured and used Saskatchewan pulse exports per acre of farmland against estimated potential Percentage change in crop insurance premiums attributable to weather events	tbd	tbd	tbd
Community Preparedness	Percentage of communities with local emergency preparedness plans completed and tested Percentage of forest communities meeting standards for FireSmart fuel management	tbd	tbd	tbd
Human Well-being	Percentage of First Nations and Métis communities engaged in climate change vulnerability assessment Percentage increase in incidences of vector-borne illnesses	tbd	tbd	tbd
			Total Score	**Total Target**

This is a model of how the provincial government intends to measure the resilience of Saskatchewan to the effects of climate change. We look forward to engaging with citizens to better refine the indicators we use to measure our resilience. At the same time, we hope the adoption and use of this model in Saskatchewan will broaden the national conversation about climate change, so that all of Canada is better prepared for the climatic, economic, and policy changes that we anticipate. There may also be some future changes that we cannot yet anticipate, and therefore we will need to periodically revisit this model to make sure that we continue to adapt our approaches as we learn more about the effects of climate change on Saskatchewan and the world.

What's next?

The next step is to move from strategy to action. The following milestones include time for consultation on the exact regulatory standards to be put in place, time to put the appropriate structures in place to implement the system, and planning to begin implementation on January 1, 2019.

1. **Engage on the Strategy**: Release strategy for comment and consultation.
2. **Proclaim or amend enabling legislation**.
3. **Release additional documents for consultation**.
4. **Refine the plan**: Hold consultations to refine the plan and develop the standards.
5. **Release regulations and guidance documents**: Introduce resilience measures and regulatory standards.
6. **Establish reporting structures**.
7. **Begin implementation**.

In this document, we've outlined the province's strategic direction, with the aim of kicking off a new, more comprehensive conversation on how Saskatchewan is preparing for climate change. Consultations will strengthen our ability to apply appropriate and valuable insight so we can adopt a plan that fits the needs and characteristics of our province.

The Government of Saskatchewan will use existing legislation, such as *The Management and Reduction of Greenhouse Gases Act*, to proclaim and/or amend necessary sections to provide legislative authority for provincial regulation.

As we work toward the overall goal of provincial resiliency and reducing global greenhouse gas emissions, we will continue to seek input from:

- *Emissions-intensive sectors*
- *Sectors that may have offsets to offer the market*
- *First Nations and Métis peoples*
- *Environmental interests*
- *Leaders of organized communities*
- *Citizens*

Details of how and when contributions to this plan can be made will be available at the Saskatchewan Ministry of Environment website at saskatchewan.ca/environment

A Made-in-Manitoba

Climate and Green Plan

Hearing from Manitobans

Manitoba Sustainable Development

2017

Manitoba

Table of Contents

A Made-in-Manitoba Plan 1

The Strategic Framework 2

Strong Foundations 4

Knowledge and Foresight 4

Planning and Adapting 5

Education and Awareness 5

Local and Indigenous Knowledge 6

The Four Pillars 8

Climate 8

Jobs 8

Water 9

Nature 9

The Keystones 10

Climate 10

Clean Energy *10*

Carbon Pricing *13*

Sector Emissions Reductions *19*

Adaptation *26*

Jobs 29

Innovation and Cleantech *29*

Financing and Investment *31*

Skills and Training *31*

Green Infrastructure *33*

Water 35

Wetlands and Watersheds *35*

Agriculture and Land Use *37*

Flood and Drought *37*

Water Quality *38*

Nature 41

Parks and Protected Areas *41*

Wild Species and Habitat *43*

Forests and Natural Areas *44*

Conservation *45*

Implementation 48

Expert Advisory Commission 48

Carbon Savings Account 48

Sectors and Communities 50

Measuring Results 50

Projected Emissions Reductions 55

Moving Forward 56

SECTION 1

A Made-In-Manitoba Plan

As Premier of Manitoba I am pleased to provide Manitobans with the opportunity to help shape our province's climate and green plan for the next decade.

Manitoba has always punched above its weight as a clean, green province. From hydroelectricity to protecting forest and wetlands, we understand the unbreakable connection between nature and community, and the environment and the economy.

It's time to do even more.

We are proposing a Made-in-Manitoba climate and green plan framework for your feedback and input.

VISION
Manitoba will be Canada's cleanest, greenest and most climate resilient province.

Climate change is real and is already impacting us. It is being accelerated by carbon and greenhouse gas emissions from humans. Scientists all over the world agree climate change is happening and poses a growing threat to how we live and work.

Severe storms and unpredictable weather are occurring with greater frequency. Flooding, fires and drought can cause economic and social hardship and impacts on families and communities. Wildfires and pests affect our croplands, grasslands and forests. Insurance impacts and costs are rising due to increased flooding and fires. Communities, businesses and governments face higher disaster management costs as a result.

Farmers growing our food are on the front lines of climate change in Manitoba. Changes in weather, water and heat affect what they plant and how they harvest.

But there is hope. Working together, we can become more resilient at both the provincial and local levels in the face of climate change. We can gain jobs and economic opportunities by making smart investments in clean technology and green jobs. And we can reduce carbon pollution causing climate change.

Climate change and sustainable development are part of the same opportunity for Manitoba. We need to view them together. There are real co-benefits to both our environment and economy of having an integrated climate and green plan.

Protecting wetlands and watersheds, for example, helps wildlife and sustains habitat. But it also enhances our water retention capacity in the face of climate-induced flooding. Green infrastructure investment creates jobs but also makes us more resilient against climate change. It enhances quality of life for Manitobans by protecting the environmental resources upon which we depend.

We believe in the principle of sustainable development, which looks at human development in a way that acknowledges the importance of and need to balance environment, economic and social objectives. It is the idea that we should strive to meet the needs of the present without compromising the ability of future generations to meet their own needs. Our whole strategic approach will be built on this principle — to lead and innovate in sustainable development.

That is why we renamed the department responsible for the environment and natural resource management to Manitoba Sustainable Development. Our proposed climate and green plan flows from that key principle.

We have a bold new vision for a clean, green Manitoba. Here it is:

Manitoba will be Canada's cleanest, greenest and most climate resilient province.

It is a vision based on the strong foundations already put in place by Manitobans.

It is a vision we can achieve with this strategic framework we are proposing to Manitobans.

Give us your views, ideas and suggestions. We want to hear from you.

Original signed by
Premier Brian Pallister

SECTION 2

The Strategic Framework

Explaining the Strategic Framework

The proposed strategic framework provides both scope and direction to Manitoba's Climate and Green Plan. At a glance, it conveys a broad sense of the strategic objectives of the plan. It possesses five key attributes.

First, it is comprehensive.

The framework covers the full range of sustainable development approaches and activities from climate to jobs to water and nature.

Second, it is integrated.

It brings together the environment and the economy through the strategic approach of sustainable development leadership and innovation.

Third, it is focused.

It stays focused on the top priorities and needs of Manitobans through the pillars and keystones rather than a scattered list of item after item.

Fourth, it is dynamic.

It sets out short, medium and longer-term actions allowing for even more measures to be undertaken within the strategic framework, as needs arise and resources permit.

Fifth, it is practical.

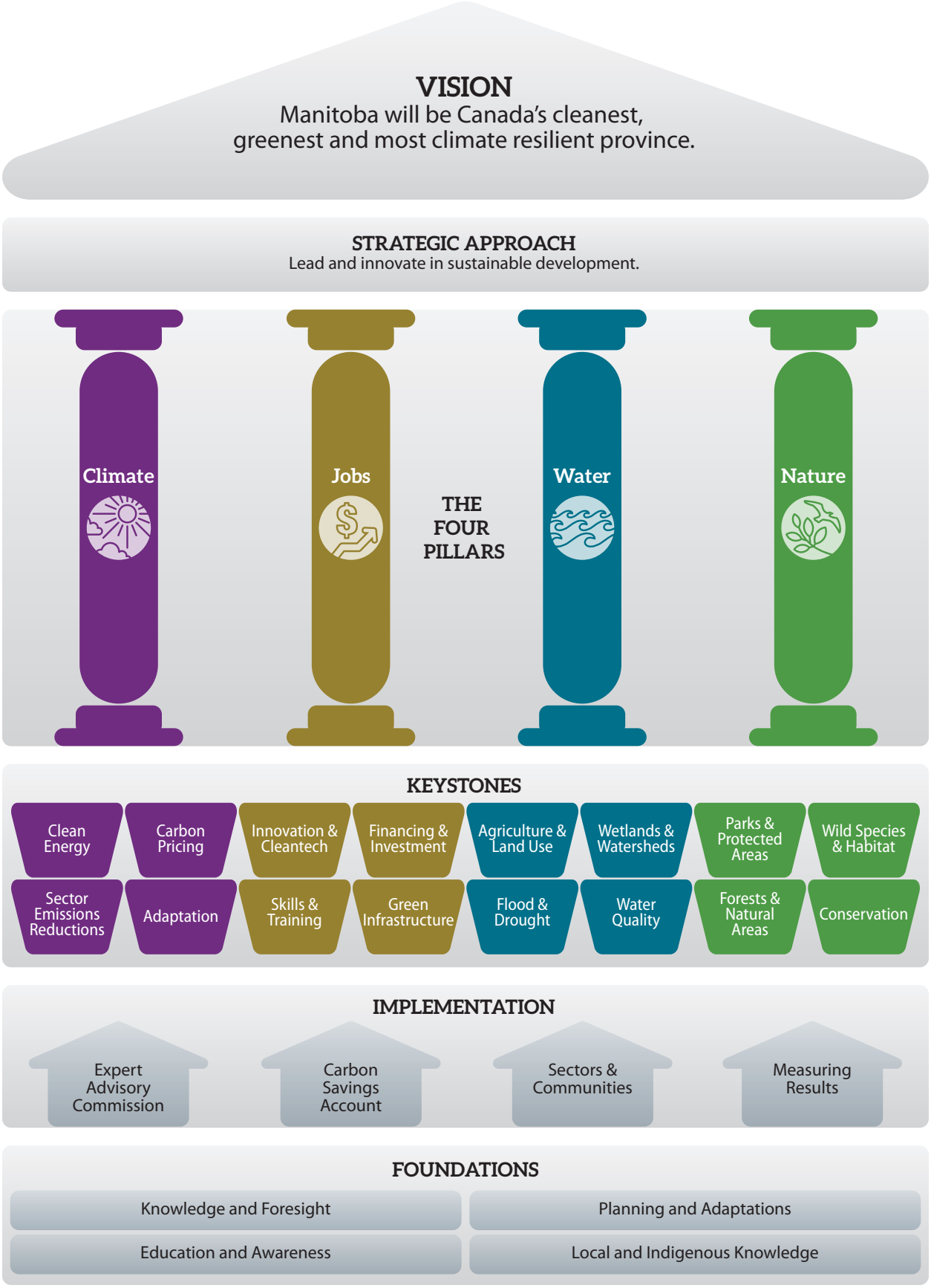
It sets out clear and realistic ways to be implemented at the outset, ensuring we can make real progress towards the vision and goals it sets out.

The strategic framework is grounded on strong foundations. These are set out to make clear the knowledge and evidence-based approach we propose. And it explicitly involves Manitobans by taking a longer-term view of how thinking and acting sustainably can improve our lives and livelihood.

The next section explains the foundations in more detail.

Questions for Discussion

- What are your views on the key elements of the strategic framework?


VISION
Manitoba will be Canada's cleanest, greenest and most climate resilient province.
STRATEGIC APPROACH
Lead and innovate in sustainable development.
Climate
Jobs
THE FOUR PILLARS
Water
Nature
KEYSTONES
Clean Energy
Carbon Pricing
Innovation & Cleantech
Financing & Investment
Agriculture & Land Use
Wetlands & Watersheds
Parks & Protected Areas
Wild Species & Habitat
Sector Emissions Reductions
Adaptation
Skills & Training
Green Infrastructure
Flood & Drought
Water Quality
Forests & Natural Areas
Conservation
IMPLEMENTATION
Expert Advisory Commission
Carbon Savings Account
Sectors & Communities
Measuring Results
FOUNDATIONS
Knowledge and Foresight
Planning and Adaptations
Education and Awareness
Local and Indigenous Knowledge

SECTION 3

Strong Foundations

FOUNDATIONS

Knowledge and Foresight	Planning and Adaptations
Education and Awareness	Local and Indigenous Knowledge

The initiatives outlined in this plan are proposed as measures to move us toward a more prosperous and sustainable future. But, our success will depend not only on the actions we take but on the foundations upon which we build.

Our vision is that of a clean, green and climate resilient province. We will achieve this vision by:

- understanding the changes affecting our environment and economy
- planning for and adapting to those changes
- working together on solutions
- making sure we follow through on our commitments

Knowledge and Foresight

The world is changing, in ways that are both hopeful and concerning. How we respond to these changes is important and the more we understand them, the better able we'll be to navigate them. This requires being at the forefront of knowledge about the phenomenon of climate change and what it will mean to our province. It means having the foresight to look beyond the next few years and make decisions that put us in good stead for decades to come. It also means understanding better how protecting the environment can lead to more sustainable prosperity. Ecological goods and services provide a practical linkage between the environment and economy.

One of the more concerning changes we face today is climate change. Climate change refers to long-term changes in global temperatures and patterns of precipitation, as well as the consequences that follow. Climate change is nothing new. Indeed, thousands of years ago Manitoba was covered by thick sheets of ice. At other times it's been flooded by deep and expansive inland lakes. But unlike the past, where changes occurred slowly over very long periods of time, today's climate is changing rapidly, primarily due to the unprecedented emission of industrial, agricultural and energy-based greenhouse gases (GHGs) into the atmosphere.

What is the Greenhouse Effect?

The burning of fossil fuels like gas, oil and coal creates carbon dioxide, a greenhouse gas (GHG) that acts like an atmospheric blanket to trap and hold the sun's heat close to the earth. But as we increase our use of fossil fuels, we increase the levels of GHGs in the atmosphere, thereby thickening the blanket and trapping in more heat. This results in higher average global temperatures, which in turn cause melting glaciers and ice caps, rising sea levels, changes in precipitation and weather pattern, and potentially dangerous impacts on both people and the planet. A projected temperature outlook produced at the University of Winnipeg indicates the Canadian prairies annual temperature could increase by five to 10 degrees Celsius by 2090.

When the climate changes rapidly, it can have both gradual and rapid impacts on people, places and prosperity.

What are some of the changes we might expect? Current scientific models suggest that Manitoba may experience increasingly warmer overall conditions, hotter summers, changes in precipitation, unpredictability of weather, and increased frequency of extreme events such as storms, floods and forest fires. Climate change can alter habitats and local wildlife populations, pose challenges to agricultural production, impact livelihood activities, and damage infrastructure, affect human health and threaten our economy.

The Manitoba government acknowledges the seriousness of this issue and what it might mean for our province. Through science and applied research, we are committed to giving communities and key sectors the information and tools needed to help them plan and adapt in response to a changing climate.

Planning and Adapting

Manitobans know the value of planning. More than most, we understand the power of floods, fires and storms. Through bitter experience we have seen what can happen if we are unprepared for such events.

We must support actions to help slow the rate of climate change, strengthen our ability to adapt to the changes that may come, and build a province that is both prepared and resilient in the face of climate change risk.

> A **climate-resilient** society is one that is able to withstand, respond and recover quickly from the impacts of a changing climate.

This means sharing more widely what the science is telling us about climate change as well as other environmental impacts due to development or neglect.

It also means creating new planning tools for communities and others to help them make durable decisions based on sustainable development principles. For example, factoring extreme and unpredictable weather events into infrastructure and watershed planning is sound risk management. So is thinking of innovative ways to grow our crops and manage our businesses to adapt to changes in climate.

Being prepared — and therefore more resilient — is really what planning and adapting is all about.

Education and Awareness

Manitobans can do more when they know more. Education and awareness are key to making more informed choices about sustainability, as a province, community, or as individuals.

Whether it is recycling waste or being more energy efficient, each of us can help make a difference. And each of those contributions add up.

Part of making change happen is to ensure that everyone is aware and educated on what's at stake and how each of us can help. Climate change, while affecting us now, will impact our children and grandchildren much more. Schools, colleges and universities can play significant roles in creating the momentum for change.

We need to be mindful that not all Manitobans will be affected by climate change in the same way. Some people may find it easier to adapt and prosper. Others may have a more difficult time with changes. Manitoba's Indigenous peoples, for example, may be disproportionately impacted by climate change, particularly in northern regions, where more rapid warming has already begun to impact lake ice and permafrost, winter roads and infrastructure, and changes to ecosystems and wildlife habitat. Similarly, depending on their region and economic situation, certain agricultural producers, economic sectors, businesses, communities and families may find it more difficult to adjust to sudden changes.

We will succeed in achieving our vision through greater education, training and awareness. By sharing our perspectives and experiences, we can strengthen our common purpose and find viable solutions.

Local and Indigenous Knowledge

Manitobans' personal experiences are a key foundation upon which actions on climate change and sustainability can be built. Long exposure to the natural forces of weather and nature gives us a rich understanding of its strength and what can be done to adapt and prosper.

Indigenous peoples hold true to a seven-generation philosophy of living at one with their surroundings. Traditional knowledge passed on from generation to generation can be a powerful foundation upon which to build the next generation of sustainable development actions.

Farmers also have extensive experience and knowledge of the land and climate. They are often among the first to feel the sudden negative impacts of a changing climate and extreme weather events. These impacts may threaten the security and profitability of these family enterprises in a direct and profound way. Bringing their knowledge to the forefront to help address climate change, water and land use is smart and useful.

What is one tonne of CO_2 ?

One tonne of CO_2 is emitted every time someone:

- drives 4,500 kilometres
- heats a home for three months

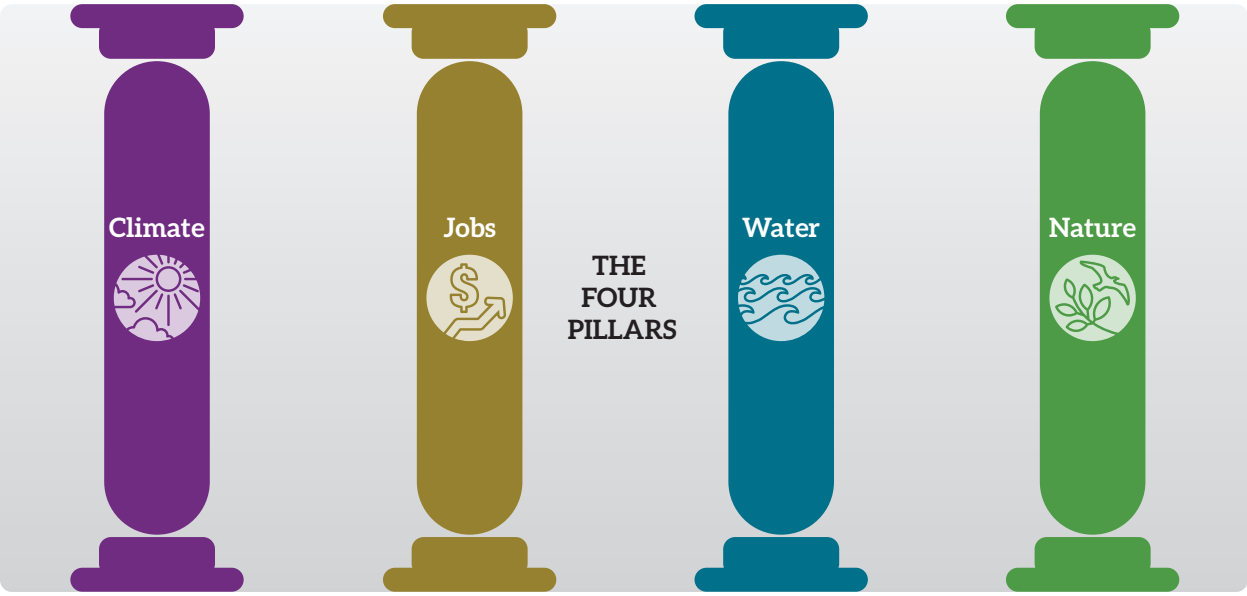
Physically manifested, one tonne of CO_2 emissions would be eight cubic metres in size.

Questions for Discussion

- Are these the right foundations?
- How can we strengthen these foundations to our collective benefit?

SECTION 4

The Four Pillars



The proposed Manitoba Climate and Green Plan sets out four main pillars as its integrated focus. Each pillar has four keystones that reflect and guide the individual actions for that pillar. Together, the four keystones make up the main areas of activity for each pillar. New actions can be added to each keystone to keep the whole plan dynamic and forward looking.

Climate

The climate pillar's mission is to reduce GHG emissions, invest in clean energy and ensure Manitoba adapts to climate change impacts. It contains carbon pricing as a principal tool to help reduce emissions. Success in tackling climate change means using free-market forces and smart regulation together to make meaningful, step-by-step emissions reductions that fit Manitoba's energy, economy and emissions profile. It is about doing our part, realistically and effectively, as Canada and the world further transition to a low-carbon economic future.

More carbon dioxide in the atmosphere is projected to lead to more instances of intense storms and flooding, eroding shorelines, extreme heat and droughts, and destructive wildfires in Manitoba. These extreme weather events from a changing climate impose real costs on Manitobans.

Climate Change refers to any changes in climate over time, whether as a result of natural phenomena or human activity.

Jobs

Sustainable development brings the environment and economy together. It means jobs and economic opportunity for Manitobans, as well as the need to protect and preserve our natural environment and live and act sustainably. Having a jobs pillar shows a core focus on using sustainable development to help create new jobs and economic growth for Manitobans. This includes green infrastructure investment, as well as investing in all aspects of clean technologies and innovations that create new jobs in a new economy. Small and medium-sized businesses can benefit from the best financing and investment tools they need to start up and grow. Education and training can assist individuals, businesses, industry sectors and communities to develop the knowledge and skills needed to seize new opportunities in a clean, green economy.

Water

Water is the essence of life. The water pillar brings together challenges of water quality and water quantity. It recognizes the important relationship between land use and water quantity and recognizes that management must happen locally and regionally on a watershed basis. It addresses the twin perennial issues of flood and drought that have plagued Manitoba over the years.

Wetlands and well-managed watersheds are critical to preserving habitat and wildlife. They can also act as natural drainage features in a time of climate change and flooding. This pillar brings all key aspects of water management together in a concerted mission to find integrated solutions that work.

Agriculture is a mainstay of Manitoba's economy. Addressing land and water use together can help harness natural opportunities for managing irrigation, prospering through climate change, sequestering carbon on agricultural land, and increasing yields.

Nature

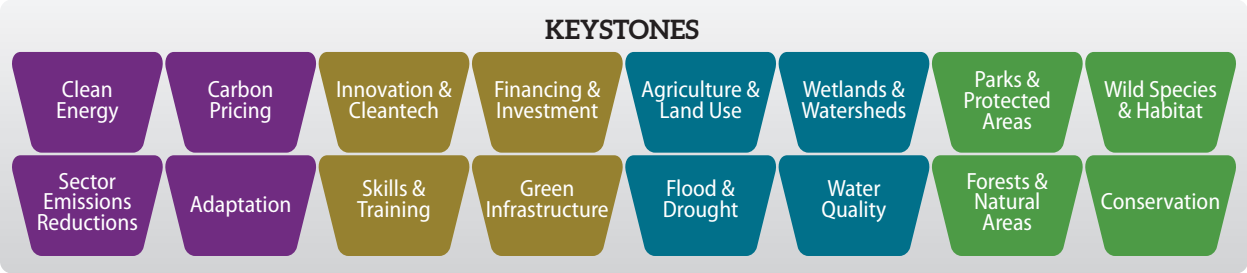
Respecting nature in all its majesty and vulnerability is the mission of the nature pillar. It begins with upholding and enhancing our beautiful provincial parks system, so Manitoban families can enjoy a greater connection with nature and ecotourism. Wild species and habitat fall under this pillar so we can preserve species at risk and foster stronger natural growth of our unique Manitoba wildlife. Manitoba, in partnership with Indigenous communities, is seeking UNESCO designation for parts of its boreal forest as a longer-term means of protection. This is the same boreal forest that can continue to act as a carbon sink for emissions causing climate change. Conservation ensures we actively invest in preserving our natural environment while growing through economic development.

Questions for Discussion

- Are these the right pillars to give focus to the Climate and Green Plan?

SECTION 5

The Keystones



Each pillar of the Climate and Green Plan is associated with four keystones that identify the priority areas for action. The dynamic nature of the pillars and keystones allows for the addition of activities or initiatives as time, resources, and circumstances permit.

The following sections describe each of the keystones and outline some proposed actions and measures that government and others could take to achieve the goals of the pillar. Your views on these keystones and proposed initiatives are welcome.

Climate

Clean Energy

Cleaner, more efficient energy use can help Manitobans lower their carbon emissions and lead to real cost savings and a healthier environment. By looking for opportunities to build upon our skills and ingenuity, we can generate new jobs for Manitobans and innovative technologies to market around the world.

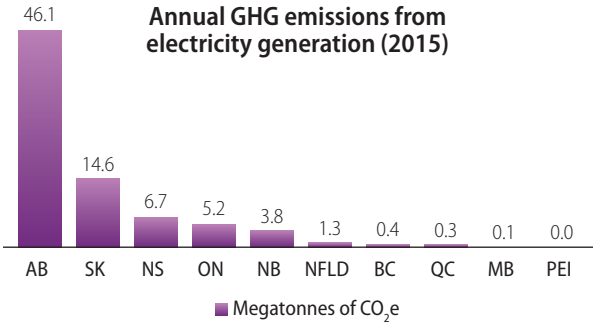
Carbon refers to carbon dioxide or CO_2, the most common greenhouse gas.

CO_2e (or carbon dioxide equivalent) is the common unit used to compare various greenhouse gases based on their global warming potential. Carbon dioxide is used as the reference as it is the most common greenhouse gas in the atmosphere.

The following initiatives are currently being considered to support the Clean Energy keystone. Your comments, ideas and suggestions related to this keystone and its proposed initiatives are valuable to government. Please consider sharing your views online at: www.manitobaclimategreenplan.ca.

Manitoba's Clean Energy Advantage

Manitobans have long known the value of investing in clean energy. Since 1906, we have been harnessing clean hydro electricity from our rivers. As a result, Manitoba now has one of the cleanest electricity grids in Canada and the world with over 99 per cent of our electricity generated from clean, renewable sources. Manitoba's long-term commitment to developing its renewable energy sources, rather than relying on imported fossil fuels, has significantly reduced the province's carbon footprint. If Manitoba had chosen instead to rely on thermal generation of electricity, such as coal or natural gas plants, Manitoba's overall carbon emissions would be double current levels – 42 MT per year rather than 21 MT they are today.



This gives us a leg up in the low-carbon economic transition Canada and the world are undergoing. It means clean, low-cost power for business growth. It also means a clean, green marketing advantage in attracting new investment and promoting our Manitoba brand.

There is significant capacity in the province for additional renewable energy. The Keeyask Generating Station, set to go online in 2021, will add 695 megawatts (MW) of capacity to Manitoba's electric grid. That's enough electricity to power 400,000 homes, or roughly twice as many single-family homes as are in Winnipeg today.

Decarbonization through electrification is critical to achieving climate change targets. Manitoba and Canada have benefitted from our early investments in clean energy. We are well positioned to provide reliable, clean energy to other jurisdictions as they too begin to shift away from fossil fuels towards prosperous low-carbon economies.

Manitoba already exports clean energy across the border to Minnesota and Wisconsin, reducing emissions in those states. Exporting our clean energy to our neighbouring province Saskatchewan via a new western electricity grid would reduce fossil fuel energy use in that province and help Canada achieve its overall emissions reduction targets. In January 2016, Manitoba Hydro and SaskPower agreed to a 20-year, 100 MW power sales agreement, which could lead to annual reductions of approximately 200,000 to 400,000 tonnes of carbon dioxide in displaced Saskatchewan electricity emissions. Federal financial support for a new and even larger transmission line could result in annual emissions reductions of about three megatonnes of carbon dioxide in Saskatchewan by using clean Manitoba hydro electricity.

Decarbonization refers to the current trend to shift energy use from fossil or carbon-based fuels to clean energy sources.

Efficiency Manitoba

Manitoba's clean energy advantage puts us solidly on the path to a prosperous, low-carbon economy. But there are also advantages to using our energy resources more wisely and efficiently right now.

Manitoba winters are cold and many Manitobans rely on carbon-emitting natural gas furnaces to stay warm. Annually, Manitoba consumes around 1.6 billion cubic metres of natural gas, which translates to approximately 3,000 kilotonnes of carbon dioxide. Manitoba has introduced legislation to create a new energy-saving demand-side management agency known as Efficiency Manitoba. This new stand-alone agency will help households and businesses reduce their energy consumption and save money on their electricity bills. That means lower energy and Hydro bills and more jobs.

By reducing electricity and natural gas consumption through targeted programming, Efficiency Manitoba will realize legislated targets of an 11.25 per cent reduction in domestic natural gas demand and a 22.5 per cent reduction in domestic electricity demand over a 15-year period. The natural gas savings would translate into GHG emissions reductions of approximately 2,700 kilotonnes over a 15-year period. It will be up and running in 2018.

Demand-side management refers to energy conservation and efficiency activities designed to reduce the demand for energy and electricity as well as using more green heat.

Green Heating

Heat is often the single largest reason we use energy in our society. In Manitoba, building and water heating consumes roughly one third of energy use and represents the majority of emissions attributed to the operation of buildings.

For many households and businesses there are real long-term savings to be gained by switching from fossil fuel heat, such as natural gas or heating oil systems, to green heat options such as geothermal, solar heat and biomass.

Transitioning to green heat can create new markets and new opportunities. These systems generate renewable heat energy, reduce carbon emissions, generate local jobs and reduce dependence upon imported fossil fuel. Local and district heating options that incorporate these choices can have a genuine impact on reducing emissions.

Despite long-term energy savings, the upfront investment required for green heat systems can prevent households and businesses from adopting them. We will explore programming and financing ideas to support households and businesses in green heating options.

What is Biomass or Bioenergy?

Biomass energy or bioenergy refers to all forms of renewable energy that are derived from plant materials produced by photosynthesis. Biomass fuels can be derived from wood, agricultural crops and other organic residues. These fuels can be obtained from many sources in Canada, including sawmills, woodworking shops, forest operations and farms.

Electrification of Winnipeg Transit

Manitoba has been a pioneer in electric bus technology. The current demonstration of four battery-electric buses with Winnipeg Transit is the most advanced electric bus project in Canada, and one of the most advanced in the world.

An opportunity exists to build on this early success by increasing the implementation of electric buses beyond the current pilot project. But this has to be considered in a practical and cost-effective way. The Manitoba government and the City of Winnipeg have been jointly exploring options on how to increase the number of electric buses, and how to address the key planning and electric infrastructure issues around integrating the new technology into a complex transit system that has, so far, been designed around the characteristics of conventional diesel buses.

Based on current diesel consumption, a longer-term goal of fully electrifying and decarbonising transit would translate to GHG emissions reductions of more than 50,000 tonnes per year. At the same time, electrifying transit provides other benefits besides reduced GHG emissions. These include lower fuel and maintenance costs, improvements in local air quality, reduced noise and enhanced energy security.

Community Energy Planning

Community Energy Plans (CEPs) are tools that can support municipalities' efforts to better understand their local energy use and costs, as well as consider future growth needs, identify opportunities to conserve and improve energy efficiency, reduce GHG emissions in the community, and help drive local economic development. CEPs take an integrated approach to energy planning by aligning energy, infrastructure and land use planning.

Manitoba Hydro has partnered with Dauphin and The Pas to deliver a two-year pilot Community Energy Efficiency Project. The pilot project involves bringing together local governments, Manitoba Hydro and community members in the creation and implementation of local community energy efficiency plans. Such plans provide guidance for lowering energy consumption in the community and leverage existing Power Smart programs for energy efficiency upgrades in residential, commercial and industrial sectors. To assist the communities in developing their energy plans, Manitoba Hydro provided them with profiles of their energy consumption patterns for use in setting priorities and establishing goals and objectives.

The focus of the current pilot program is on energy efficiency to help reduce energy consumption and lower utility bills in the participating communities. Efficiency

Manitoba could expand this pilot program to additional communities throughout Manitoba and could include opportunities beyond energy efficiency. An expanded Community Energy Efficiency Project could assist municipalities to:

- better understand their local energy use and needs
- identify opportunities for energy efficiency and conservation
- consider options for local clean energy generation
- support local economic development
- develop other plans to meet their energy goals

An expanded project should also take an integrated approach to energy planning by ensuring municipalities align their community energy plans with infrastructure plans and land-use development plans, as required by provincial planning regulation under The Planning Act.

Off-Grid Communities

The majority of Manitobans are served by renewable electricity provided by Manitoba Hydro. Four northern communities that are not connected to the grid, however, rely on diesel generators for their electricity. These generators are sources of carbon emissions, among other pollutants, and are dependent on the delivery of diesel fuel — typically by winter road — an option that is becoming increasingly uncertain as winters shorten and average temperatures increase due to climate change.

The Manitoba government is working with the communities, Manitoba Hydro, the federal government, and the private sector to explore options for replacing diesel generations with clean and renewable sources of electrical energy. This shared commitment could help communities reduce energy costs, save money and create local jobs.

Carbon Pricing

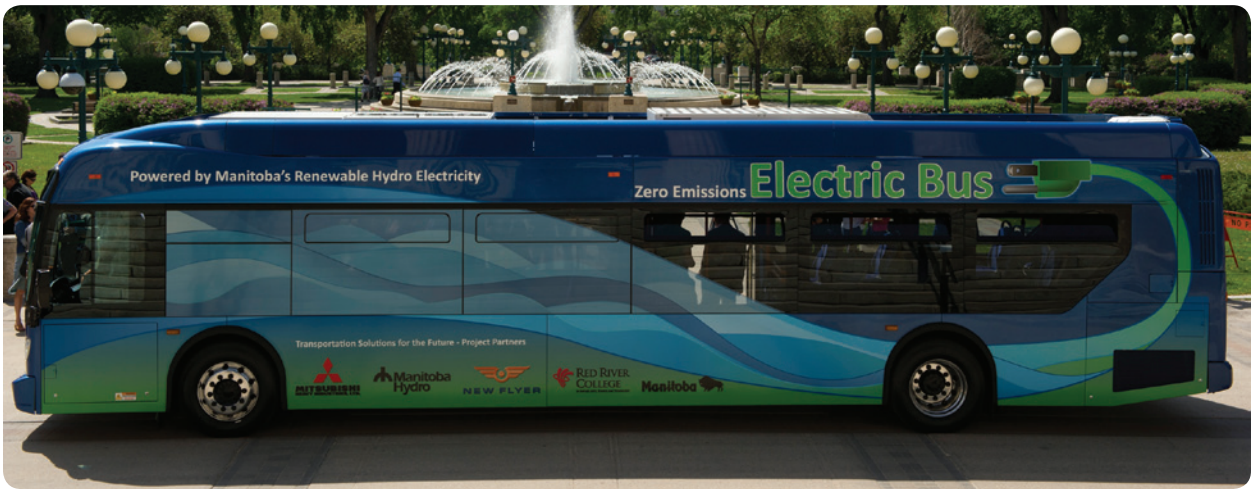
The federal government is requiring all provinces to put carbon pricing in place beginning in 2018. If we do not create our own carbon pricing system for Manitoba, Ottawa will impose one on us.

Currently, nearly 85 per cent of all Canadians pay a price on carbon. British Columbia (BC) was the first province to introduce a price on carbon, in the form of a carbon tax. Since its introduction in 2008, carbon emissions in BC are down 5.5 per cent, while the province's economy has grown by 12.4 per cent.

Elsewhere, Quebec and Ontario have cap-and-trade systems, linked to California's carbon market, and Alberta has a hybrid system containing both a carbon levy and performance-based emissions standards.

There are two basic types of carbon pricing: a carbon levy or a cap-and-trade system on large industrial emitters. A cap-and-trade system would not work in Manitoba, as there are only a few large emitters that would qualify. It would put the full burden to reduce emissions on just a few companies in our province. This would not reduce emissions by a significant amount and would require costly red tape to set up and administer.

A carbon levy is simpler and more effective for Manitoba. It can cover more emissions in our economy leading to more reductions, which is the goal. It gives price certainty to business, helping them plan and invest accordingly. And it costs less to put in place than any other system.



What is Carbon Pricing?

Carbon pricing refers to mechanisms that put a price on carbon with the goal of reducing GHG emissions.

Carbon pricing encourages the conservation of fuel, promotes the adoption of clean alternatives, and pushes companies, scientists and engineers to develop newer and more innovative clean energy technologies — technologies we need now and in the years ahead.

Your comments, ideas and suggestions related to the Carbon Pricing keystone and revenue recycling options are valuable to government. Please consider sharing your views via our online discussion page at: **www.manitobaclimategreenplan.ca**.

Federal Legal Authority

In 2016, the federal government announced that beginning in 2018, all provinces and territories must have either a carbon tax or cap-and-trade carbon pricing system in place with certain conditions. They call this the 'benchmark'. For those jurisdictions that do not introduce a carbon price, the federal government will impose one. They call this a 'backstop'. It would impose a carbon levy of $10 per tonne in 2018, rising by $10 per tonne each year to $50 per tonne in 2022. In doing so, the federal government would also decide how to spend Manitobans' money.

To clarify federal legal authority to impose its backstop carbon pricing plan on provinces, Manitoba asked for an independent legal opinion from an eminent Manitoba legal scholar. That opinion can be found here **www.manitobaclimategreenplan.ca**.

It concludes: *"There is a strong likelihood that the Supreme Court of Canada would uphold the proposed carbon tax/levy. It would probably do so on the basis of the federal government's taxation power."*

The opinion holds: *"The backstop measure, in and of itself, is unlikely to render an otherwise valid federal carbon tax/levy unconstitutional."*

In short, the federal government has the constitutional authority to impose its carbon pricing scheme on Manitoba in the absence of our own.

The opinion goes on to suggest, however, that an effective Made-in-Manitoba approach could be legally successful on the basis of equality of the provinces and the potentially discriminatory application of the federal backstop feature.

"A credible (though untested) argument, however, could be made about the potentially discriminatory application of the backstop feature. Suppose Manitoba adopted its own "Made-in-Manitoba" overall GHG reduction plan, which would reduce GHG emissions just as effectively as the approved federal measures (these are a specific carbon tax/levy or a cap-and-trade scheme, to the exclusion of all other types of measures which might be adopted by other provinces).

Manitoba could then argue the federal government was arbitrarily denying its authority to craft its own legislative measures in response to the issue of GHG emissions. The federal government, according to the argument, would as a result be acting inconsistently with the principle that all provinces have equal authority to legislate within areas of provincial jurisdiction."

Independent Legal Opinion to Province of Manitoba

Two things are clear from this legal opinion. *First*, Ottawa can – and will – impose its own plan on Manitobans. It has the authority to do so. *Second*, an effective Made-in-Manitoba plan rests upon a sound legal basis.

A Made-in-Manitoba Carbon Pricing Plan

The Manitoba government has committed to introducing carbon pricing to help tackle climate change. But any carbon pricing mechanism must be based on Manitoba's unique environmental and economic realities not one imposed by the federal government. The federal backstop is wrong for Manitoba. It does not respect Manitoba's green record.

Any carbon pricing system in Manitoba must recognize two essential facts: First, Manitoba is already 'clean' given our hydroelectricity system with 98 per cent of electricity generated from non-carbon emitting sources. Second, Manitobans have already invested billions of dollars in building our clean energy system and are still doing so with the Keeyask Dam and the Bipole transmission line. Adding a $50 per tonne carbon price on Manitobans at the same time Hydro rates are rising is neither fair nor sensible.

If Manitoba had not embraced clean hydro, then emissions in the province would be double what they are today – 42MT rather than 21MT. Manitobans deserve credit for this early action and massive public investment. These previous contributions will be recognized in our Made-in-Manitoba carbon pricing policy. They need to be recognised by the federal government too.

We want to do our part but we have already been doing our share.

The federal government should recognize this just as they recognized actions taken by other provinces for their climate plans. Every other province with a previous climate and carbon pricing plan had it recognized by Ottawa at the outset, in the design of its benchmark and backstop provisions. One was not imposed on them. Manitoba should receive the same equal treatment.

The purpose of carbon pricing is to reduce emissions. It is not about having a new tax to simply raise more money for government. Because Manitoba is already 'clean' with its hydroelectric power grid, it will require higher carbon prices to achieve equivalent emissions reductions compared to other provinces. That would mean higher and higher carbon prices for fewer and fewer relative emissions reductions. That makes no sense.

The federal government and the opposition parties in the Manitoba legislature want higher carbon prices on Manitobans. That is wrong for Manitoba. It will hurt Manitobans without helping the environment.

Higher Carbon Prices by Ottawa and Manitoba's NDP Government

Both the federal government and the previous NDP government in Manitoba advocate for high carbon prices than the Made-in-Manitoba plan. Here's what their proposals would mean to you:

The cost of meeting the federal government's 2030 target applied to Manitoba would be around $230 per tonne or 48¢ more per litre of gas.

The cost of meeting the previous provincial government's greenhouse gases reduction target would be around $270 per tonne by 2030 or 57¢ more per litre of gas.

Both of these plans would impose an intolerable financial burden on Manitoban families and businesses – already facing one of Canada's highest tax burdens - to meet completely unrealistic targets for our province. Their approaches would cripple our economy and raise costs for every household and business in Manitoba.

The federal government has made it clear that if Manitoba does not implement its own carbon pricing plan, then Ottawa will impose its own plan. All of the money generated by Ottawa's plan would go to the federal government for spending in Manitoba as they see fit. It would be based on Ottawa's priorities not those of Manitobans.

This is not acceptable. Doing nothing, therefore, is not an option. We need a Made-in-Manitoba plan that works for us to keep the federal government from imposing its high-priced carbon plan on Manitobans.

A Made-in-Manitoba climate change plan requires a Made-in-Manitoba carbon price to make it work. That price is not $50 per tonne as the federal government says it would impose.

The Manitoba Climate and Green Plan proposes instead a Made-in-Manitoba carbon pricing with a low, flat carbon price of $25 per tonne – half the price of the federal government. It will start *and stay* at $25 per tonne. It will not rise to $50 per tonne as the federal government wants. We call it the *Prairie Price* – low and level like the prairies.

In 2022, a formal national review of the country's climate policies and carbon pricing by governments will occur. We will resist as detrimental and unnecessary any efforts by the federal government to impose a higher carbon price and additional carbon taxes on Manitobans before this review. We will conduct our own assessment of progress and report to Manitobans and all Canadians at the end of the first five-year Manitoba Savings Carbon Account period in 2022 as set out in our Made-in-Manitoba plan.

The federal government needs to recognize the flexibility of approaches of Canadian federalism including Manitoba's. As Manitoba's independent legal opinion concluded:

"…the Paris Agreement is more flexible about the global-state (including global-Canada) relationship, than the carbon tax/levy is flexible about the Canada-provinces relationship."

NDP Government Inaction on Climate Change

The Auditor-General examined the previous NDP government's climate change plan and actions, stating: "Despite the efforts of the Department and government over the past decade, there has been little change in Manitoba's greenhouse gas emissions."

The Auditor-General further concluded: "There was no regular progress reporting on whether the climate change project was on time, on budget, and going to achieve its stated goals."

In fact, the Auditor-General determined that: "The Department was aware by the fall of 2009 that the initiatives in its 2008 plan would be insufficient to meet the 2012 target enshrined in the *Climate Change and Emissions Reductions Act*."

Managing Climate Change,
Report of the Auditor-General, 2017

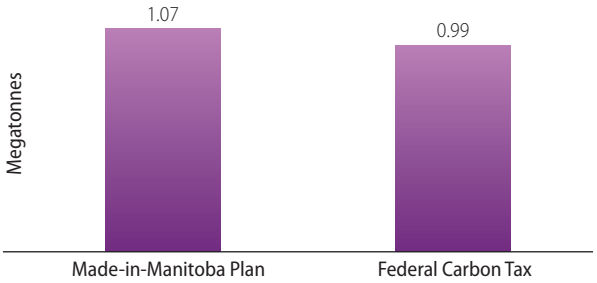
Made-In-Manitoba – Better for the Environment and Better for the Economy

Our 'Prairie Price' costs less yet actually reduces more emissions than the federal plan. It does so by starting at a higher rate causing more emissions reductions at the outset that build up faster than the federal price does. By staying at $25 and not rising, it costs less to Manitoban families and businesses than the federal price over the five-year period. It makes sure Manitoba families and businesses are not subject to higher and higher carbon costs year after year. It gives Manitoba businesses more certainty and consistent costs for their own investment planning.

Our plan is better for the environment and better for the economy. It reduces more emissions than the federal plan, costs less to the economy, and lets Manitobans decide how they want their carbon tax revenue re-invested.

The following figure compares the estimated emissions reductions achieved under the Made-in-Manitoba plan compared to the federal carbon tax plan.

Cumulative Emissions Reductions (2018-2022)

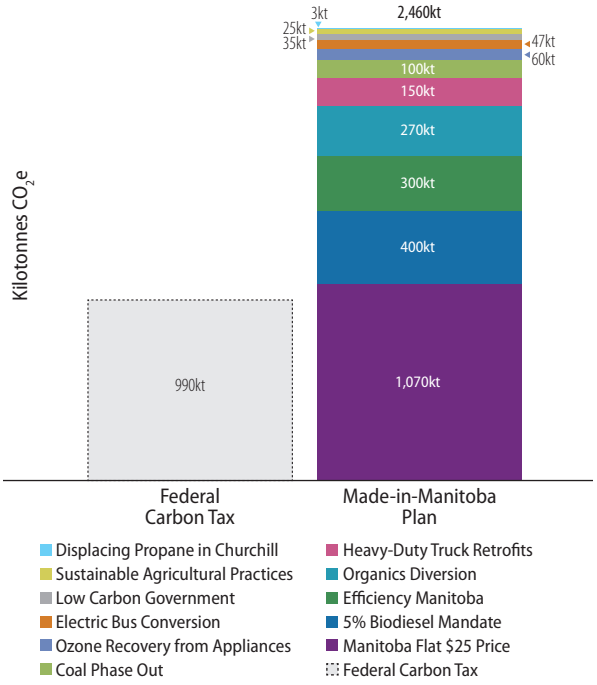


The federal $50/tonne carbon pricing plan would actually result in 80,000 tonnes fewer emissions reduced by 2022, compared to the Made-in-Manitoba carbon pricing plan.

Our plan is better for Manitoba. Keep the carbon price lower by recognizing these early Hydro investments and use targeted actions to get even more emissions reductions from specific sectors. The sector emissions reductions set out in the next section will generate over 1 million more tonnes of cumulative carbon emissions reductions over the next five years, compared to the federal carbon tax.

When these two are put together, our Made-in-Manitoba plan will reduce carbon emissions by 2,460 kilotonnes – over **twice as much** as the federal carbon tax. The figure below shows this.

Federal Plan vs. Made-in-Manitoba Plan
(Estimated Cumulative Emission Reductions, 2018-2022)



Savings of the Made-in-Manitoba Carbon Tax Compared to the Federal Carbon Tax*

Over the next five years, the average Manitoba household will **save an estimated $240** under the Made-in-Manitoba plan compared to the federal plan. In 2022 alone, **those savings will be worth $240** per household when the Made-in-Manitoba price will be half the federal price.

In total, Manitoba taxpayers and businesses would pay about **$260 million less** in carbon taxes under the Made-in-Manitoba plan compared to the federal plan.

*Estimates based on 2015 emissions reported under ECCC National Inventory Report, 1990-2015. Savings from natural gas heating and vehicle use.

Our Made-in-Manitoba plan will mean more emissions reductions at less cost to Manitobans.

Costs less, reduces more: two good reasons for a Made-in-Manitoba carbon and climate plan.

Manitoba to have second-lowest carbon price in Canada

2018	2022	
BC = $35	$50	New BC government to raise by $5/tonne each year
AB = $30	$50	Agreed to follow federal plan beginning in 2021
SK = $10	$50	Imposed federal backstop presumed
MB = $25	$25	Made-in-Manitoba Prairie Price
ON = $18	$22 floor price	Cap-and-Trade price forecasted*
QC = $18	$22 floor price	Cap-and-Trade price forecasted*
NB = $10	$50	Agreed to following federal plan beginning in 2018
NS = Under development		Federal equivalency for NS internal cap-and-trade plan
PEI = $10	$50	Agreed to following federal plan beginning in 2018
NL = $10	$50	Agreed to following federal plan beginning in 2018

*Ontario Energy Board Long Term Carbon Price Forecast Report (2017)

Output-Based Pricing for Large Emitters

Our Made-in-Manitoba plan takes steps to protect economic growth and jobs.

To minimize competitiveness and carbon leakage risks to Manitoba's large industrial emitters who are emissions-intensive and trade-exposed, the province will bring in an output-based carbon pricing system. This form of carbon pricing has been recommended to the government by the companies themselves. The system will be transitioned into place during 2019 and will be developed in full consultation with affected firms. It costs them less than simply applying the carbon pollution levy to them thereby reducing the actual cost impacts of carbon pricing passed onto customers.

Here's how it works.

Output-based pricing applies the carbon pollution price to that portion of facility's emissions that exceed a designated emissions-intensity performance standard for that type of facility. Facilities that emit less than is allowed on an annual basis based on their performance standard, would receive a credit for each tonne of surplus CO_2 between the standard and what was actually emitted. Facilities that emit more than is allowed under the performance standard would be required to pay the carbon levy on a per tonne basis for each tonne of CO_2 emitted above that standard. Alternatively, they could use any surplus credits they previously accumulated and banked from previous years, or purchase credits from another firm in the output-based carbon pricing regime.

The benefit of this system to large emitters is that only a specific portion of their emissions are subject to the actual carbon price (via the performance standard) so it is less economically impactful on their business. At the same time, the firm can benefit from reducing its overall emissions to avoid paying some or all of the carbon levy and to acquire credits for future trading.

This form of pricing will only apply to large industrial emitters over the 50,000 tonne threshold. It will not apply to municipal landfills or government operations.

Agricultural Exemptions

Agriculture is a mainstay of the Manitoba economy. Farms and farmers grow the food we eat. They are 'price takers' in the domestic and global economies giving them little room to manage rising costs such as fuel. We must take this into account when devising any carbon pricing plan.

Accordingly, the Made-in-Manitoba plan will include two important exemptions for farmers and agricultural operations:

First, farm operations will be exempt from the application of the carbon levy for fuel use for their farming operations. Marked fuels will not increase due to any carbon pricing being applied on diesel or gasoline at the wholesale, distribution, or pump levels.

Second, agricultural emissions will not be targeted for direct sector reductions via the carbon price or other aspects of this plan.

Reducing agricultural emissions will occur over time through a range of other policies and actions that will be developed with the farming community and agricultural sector.

Revenue Recycling Opportunities

A clear advantage of carbon pricing is in its ability to generate revenue that can be recycled back into the economy. At $25 per tonne, Manitoba's carbon price is expected to generate approximately $260 million in annual revenue.

Over the past year, the Manitoba government has been consulting with Manitobans on how to best utilize the new carbon revenue. Manitobans have told us that they would like to see the carbon revenue redirected back to Manitobans in ways that are both transparent and accountable.

Revenue recycling refers to the process by which funds generated from a carbon price are distributed or 'recycled' back to people and businesses. Unless we have our own Made-in-Manitoba plan, Ottawa will determine how and where that revenue is spent, not Manitobans. Have your say in where this revenue should go. Visit **www.manitobaclimategreenplan.ca** and make your choice. Help determine where carbon revenue should be re-invested.

In a previous survey, Manitobans told us how they would like to see the carbon revenue spent. Here are the main carbon revenue recycling options we heard: relief to households, investing in green projects, business competitiveness, clean technologies, and helping Manitoba adapt to a changing climate.

That is why the Manitoba government will introduce new carbon pricing and revenue recycling legislation that mandates the annual release of a carbon pricing and revenue report as part of the provincial budget, indicating how every single dollar from the carbon price is spent.

Three principles for revenue recycling will be established:

First, all revenue collected will go to Manitoban priorities.

Second, all revenue collected and distributed will be accounted for and reported on annually for all Manitobans to see.

Third, all revenue collected will focus first and foremost on lessening the carbon levy impact on lower and middle-income Manitobans and their families.

Relief to Households – Carbon pricing will inevitably lead to changes in prices, especially for fossil fuels such as gasoline and natural gas. This revenue recycling option would see carbon revenue used to help offset increased carbon price costs to Manitoba households. This could be used to help offset the impacts of any hydro electricity rate increases also.

Investing in Green Projects, Business Competitiveness, and Clean Technologies – The ultimate objective of carbon pricing is to reduce the amount of carbon pollution being released into the atmosphere, not hurt the economy. This revenue recycling option could see some of the carbon revenue invested into green projects and clean technologies that would drive further carbon emissions reductions.

Adapting to Climate Change – Impacts of climate change are already here and happening. This revenue recycling option could see some of the carbon revenue focused on building green, resilient infrastructure such as agricultural drainage systems and water retention systems to meet challenges posed by floods and droughts.

Sector Emissions Reductions

As important as having a price on carbon is, it can only take us so far. Carbon pricing coverage and price per tonne would have to be set much higher than what is being discussed in order to drive the level of emissions reductions required to meet all our climate ambitions. That's where complementary climate actions that target emissions reductions in specific sectors come in.

Our Made-in-Manitoba plan combines a lower carbon price with targeted sector emissions reductions to achieve greater results than with the federal carbon price plan alone.

From 2018-22, our plan will achieve more than twice as many emissions reductions as the federal carbon tax. Over half of those projected emissions reductions will come from non-carbon pricing actions.

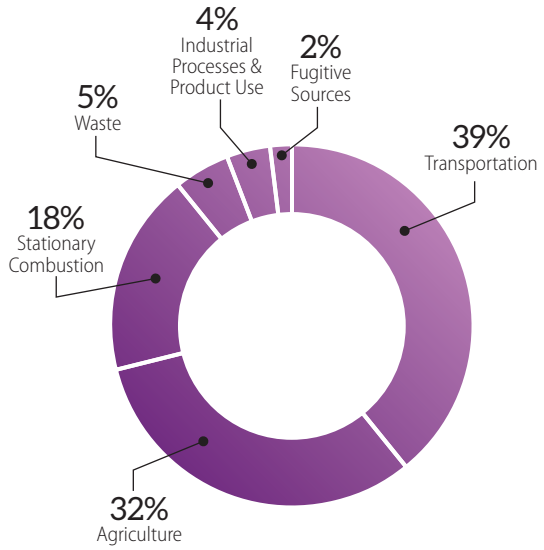
More emissions reductions at a cheaper economic cost is the Made-in-Manitoba plan. Better for the environment and better for the economy.

The following initiatives are currently being considered to support the sector emissions reductions keystone. Your comments, ideas and suggestions related to this keystone and its proposed initiatives are valuable to government. Please consider sharing your views online at: **www.manitobaclimategreenplan.ca**.

Transportation Emissions

Transportation helps connect people and businesses to the goods and services they need, thereby playing a vital role in Manitoba's economy and the well-being of its citizens. At the same time, our most common forms of transportation produce emissions that are harmful to the environment and human health. Transportation is Manitoba's largest source of carbon pollution, representing 39 per cent of the province's total carbon output. Despite fuel-efficiency gains and stricter emissions standards for vehicles, more cars and trucks on the road have resulted in higher carbon emissions from transportation in the province.

Manitoba's 2015 GHG Emissions = 20.8 megatonnes CO_2e



Over 93 per cent of transportation in Manitoba currently relies on fossil fuels. Although the use of fossil fuels is expected to persist into the foreseeable future, there are other clean transportation fuels available to help Manitoba achieve sustainable economic and environmental performance.

Manitoba has been a leader in the production and adoption of biofuels. We were the first jurisdiction in Canada to adopt a biodiesel mandate for diesel fuel. Our ethanol mandate is 8.5 per cent, and is the highest blending requirement in the country. Replacing petroleum fuels with clean biofuels has reduced carbon emissions in the province by over three million tonnes since its introduction.

What are Clean Fuels?

Biofuels refers to ethanol, biogas, biodiesel and renewable diesel.

Biodiesel is a non-toxic and biodegradable renewable fuel source typically made from oils such as vegetable oils, animal fats or used cooking oils.

Biogas is a renewable natural gas derived from organic waste sources such as landfills, wastewater and farms. Biogas is completely interchangeable with conventional natural gas and compatible with existing natural gas pipelines.

Ethanol is a high-octane, renewable fuel source derived from primarily agricultural or forestry waste products.

Renewable diesel is a biomass-based renewable fuel source that is almost chemically identical to petroleum diesel.

We can do more to continue our leadership in clean fuels, and Manitoba is considering increasing the use of biofuels across the province. For example, we can encourage the voluntary use of ethanol by working to get mid- and high-level ethanol blends at retail filling stations for use in flex fuel vehicles. We can also raise the provincial biodiesel mandate from two per cent to five per cent, which would achieve an additional 100,000 tonnes of CO_2e reductions annually. In combination with fuel efficiency, these actions can help to drive further emissions reductions and spur innovation in clean fuels.

Manitoba is well positioned to provide canola feedstock for enhanced biodiesel production, due to an increase in the mandate from two per cent to five per cent since it is already one of the top two crops grown in the province. Biodiesel's life cycle greenhouse gas emission level varies according to the crop used, which is where canola might have a competitive advantage over other feedstocks. Canola consistently ranks as the best biofuel feedstock when calculating net carbon emissions.

The federal government has announced they will be introducing a new national clean fuel standard that will reduce Canada's carbon emissions by 30 MT per year by 2030. Meeting this new national standard will likely require measures to advance clean fuels that are over and above biofuel mandates alone.

One of the greatest opportunities for reducing transportation emissions is through electrification. Manitoba is an ideal place for the adoption of electric vehicles that plug-in to the electricity grid and obtain energy for motive operation. Because of our cold climate we already have more than 500,000 existing plug points at home and at work, and everyone is already accustomed to plugging in.

Innovation in trucking design can lead to more fuel-efficient outcomes. We will work with the Manitoba Trucking Association to advance the take-up of effective innovations for Manitoba's trucking fleet that help reduce emissions.

As Canada moves to pan-Canadian climate action, it will become increasingly important to harmonize trucking and vehicle regulations and rules across jurisdictions that encourage fuel efficient and climate-friendly operations.

Trucking is a long-term investment by companies and owner-operators. It is expensive to replace heavy-duty vehicles to take advantage of fuel efficiency improvements. We will encourage the federal government to improve the accelerated capital cost allowance rules surrounding new, fuel-efficient truck and engine replacement.

Rural and northern households have greater obstacles to reducing transportation emissions than urban households due to longer travel distances that are part of daily life and less flexibility to shift to lower carbon transportation. Policy approaches need to account for this.

Active and Public Transportation

Like so many places, Manitoba has built its economy and communities around the motor vehicle. We have more than 80,000 kilometres of roads, over one million registered vehicles, and related infrastructure such as countless bridges, underpasses, parking lots and traffic lights — all of which helps us get around quickly and safely.

But there are some things associated with our cars and roads that we could certainly do with less of, like traffic, pollution, and the negative health effects associated with spending too much time in our vehicles.

Fortunately, we have options. More and more Manitobans are rediscovering the freedom of biking, walking, running and taking public transportation. There are, for example, more than 12,000 daily cyclists in Winnipeg in May and June. Such activities can help reduce harmful emissions, improve health and save money, too. Options to support greater use of active or public transportation are being considered including more bike paths and lanes.

Waste Emissions

Solid waste accounts for about five per cent of Manitoba's greenhouse gas emissions. Organic materials buried in landfills produce methane gas, which can seep out of the ground and into the air. Approximately 40 per cent of residential waste and 30 per cent of industrial, commercial and institutional waste that ends up in landfills is organic material.

Methane is a powerful greenhouse gas that locks in 25 times more heat than carbon dioxide.

To reduce the amount of organic material going into landfills — and thus the resulting methane emissions from waste — the Manitoba government could consider the following actions:

- Implement a landfill disposal ban on organic materials.
- Work with food processors, grocers, hotels, restaurants and other stakeholders to promote best composting practices and provide supports and incentives, research, training and market development.
- Increase the Waste Reduction and Recycling Support landfill levy and use the revenue to support compost facilities.
- Develop a comprehensive food waste reduction and prevention initiative, in partnership with other jurisdictions and key community groups.
- Pursue measures to mitigate methane emissions and enhance methane gas capture at landfills.

Recycling non-organic materials, especially those containing ozone-depleting substances, is also critical to cutting our carbon footprint and creating sustainable communities.

To enhance diversion of non-organic waste from landfills, the Manitoba government could consider the following actions:

- Expand the household hazardous material Extended Producer Responsibility (EPR) program to include ozone-depleting substances and other halocarbon cylinders, single-use pressurized containers, foam insulation and refillable propane tanks, smoke and carbon monoxide detectors, medical sharps and veterinary products.
- Establish new EPR programs for appliances with refrigerants (e.g., fridges, air conditioners, water coolers) and small appliances.
- Implement landfill disposal bans on materials currently managed by product stewardship organizations, starting with electronic waste, batteries, tires, household hazardous waste, beverage containers and cardboard boxes.
- Introduce measures to increase the diversion of construction, renovation and demolition waste such as wood and shingles.

Agricultural Emissions

Agriculture is a key industry in Manitoba. Our vast and diverse land base, highly skilled workforce, and value-added processors enable our province to be a world leader in agriculture and food processing. Agriculture creates jobs, promotes trade, supports research and development of cutting-edge technologies, attracts investment, and propels economic growth.

Agriculture is the second-largest source of greenhouse gas emissions in the province, contributing about 32 per cent to Manitoba's total emissions (excluding fuel-use emissions). These emissions are primarily due to the application of nitrogen fertilizer to soils and biological processes such as enteric fermentation (burping) inherent to livestock.

While agriculture is a significant source of greenhouse gas emissions, agricultural soils and biomass can also serve as effective carbon sinks, helping to lock harmful carbon emissions in the ground and prevent carbon dioxide from entering the atmosphere. Manitoba is one of three provinces — along with Saskatchewan and Alberta — where agricultural soils are now considered to be a net sink for carbon storage, due to improved agricultural practices such as reductions in tillage and better rotational practices.

A **carbon sink** is any activity or process that removes carbon emissions from the atmosphere and stores them in the natural environment.

In fact, Manitoba and Canadian producers have been continuously improving their overall sustainability and production efficiency, including:

- 14 per cent less GHG per kilogram of beef liveweight in 2011 compared to 1981
- decreased enteric fermentation emissions per litre of milk by about 20 per cent since 1996
- large decreases in the area of crop residue burning since 1990
- steadily increasing average grain yields per acre of cultivated land

Manitoba's farmers are at the frontlines of climate change and need to be at the forefront of solutions. Farmers have seen firsthand the effects of a changing climate. Extreme weather and precipitation events are negatively impacting production while climate change is altering growing seasons and the types of crops that farmers can grow. There are numerous examples of creative responses by farmers to the challenges of extreme weather and climate change abound. But to achieve widespread adoption of the most effective climate change responses, farmers require support at various levels to adapt and become more resilient.

Reducing emissions from agricultural activity while simultaneously supporting this valuable sector will require research, innovation, planning and support. The Manitoba government is committed to working with producers and consumers alike to identify and develop the solutions we need to make agriculture an integral part of our vision of a clean, green and climate-resilient province.

Ecological goods and services are the environmental benefits derived from healthy ecosystems. They include market goods produced from ecosystems (commodities, food and fibre); improved wildlife habitat, or the benefits from ecosystem processes (water purification or carbon storage) and non-material benefits (recreation, aesthetic value).

The Manitoba government could consider the following initiatives to enhance the resiliency and sustainability of the agricultural sector:

- implementing a province-wide ecological goods and services program, in partnership with landowners, non-government organizations and federal and municipal governments, based on an Alternative Land Use Services (ALUS) model, to help reduce flooding, and improve water quality and nutrient management, protect and enhance biodiversity and provide other ecological benefits to society
- supporting on-farm beneficial management practices (BMPs) that provide climate change adaptation and mitigation benefits to agricultural operations
- developing a Centre for Sustainable Agriculture to support adaptation and resilience research, to seek new technologies to decrease emissions from crops and livestock, and to explore commercialization opportunities
- expanding the adoption of new precision farming technologies such as machine learning that improve the environmental efficiency of fertilizer use and farming patterns
- supporting research and commercialization of technologies for the use of natural fibres for bio-composite applications, including the expanded use of bio-energy and other bio-products with partners such as the Composites Innovation Centre
- evaluating risks, vulnerabilities and opportunities facing agricultural regions or sectors in Manitoba due to extreme weather events and climate change; and developing strategies to address identified risks, vulnerabilities and opportunities

Coal Phase Out

Manitoba's last remaining coal-fired generating unit has been in operation since 1969. Although usage has declined in recent years, the Brandon-area unit still produces between 30,000 and 100,000 tonnes of GHG emissions annually.

The Manitoba government has worked with Manitoba Hydro to accelerate the cessation of coal burning at the Brandon facility ahead of schedule, in 2018.

Low-Carbon Government

The Manitoba government seeks continuous improvement in greening operations with the intention to lead by example. As one of our largest employers with offices and operations throughout the province, the government is committed to taking action to reduce its own carbon footprint.

The Manitoba government is considering the following initiatives to put government operations and infrastructure on a path towards carbon-neutrality:

- advancing provincial green building standards for government-owned buildings and new construction activities
- exploring electric vehicle charging infrastructure at government-owned buildings
- increasing zero-emission vehicles in the government fleet
- exploring sustainable procurement and reduction initiatives for paper and other common goods

Many of the initiatives bring about long-term savings for government by reducing operating and maintenance costs, thereby helping government to achieve both environmental and fiscal sustainability.

Carbon Offsets

Nature is a powerful tool that we can harness to help reduce emissions. Carbon offsets are an innovative, market-based mechanism that rewards businesses and organizations for undertaking new projects that reduce or remove carbon emissions from the atmosphere. Credits earned through such a system could be traded in Manitoba, North America, or possibly internationally. An example of a trading system is the Western Climate Initiative.

The global carbon market is expected to grow exponentially in value from $300 million US in 2011 to $2 trillion by 2020. By 2020, carbon is anticipated to be one of the primary traded commodities across the globe. Manitoba farmers could gain financially from participating in such markets.

In partnership with other jurisdictions, the Manitoba government will explore ways to develop a carbon offset program involving agriculture, forests and wetlands. We will adopt or develop protocols for potential carbon offset projects such as:

- land use conservation measures such as restoring forests, soil management practices like low or no till farming, wetland restoration and conservation
- the capture and destruction of methane gas from landfills and livestock manure storage facilities, or combustion of this energy to produce electricity or heat
- waste recycling
- energy efficiency and non-emitting renewable electricity generation

Energy Efficient Homes and Buildings

The Manitoba government has committed to reducing emissions from homes and buildings. Annually, space heating for residential buildings generates approximately 1,000 kilotonnes of carbon dioxide, representing about five per cent of Manitoba GHG emissions. Commercial and institutional buildings generate approximately 1,300 kilotonnes of carbon dioxide annually, equal to six per cent of Manitoba GHG emissions.

Efficiency Manitoba will offer new expanded home energy efficiency programs for retrofits and upgrading.

The Manitoba government will collaborate with its federal, provincial and territorial partners to raise and harmonize its building codes and standards that improve the energy efficiency of new residential and commercial buildings.

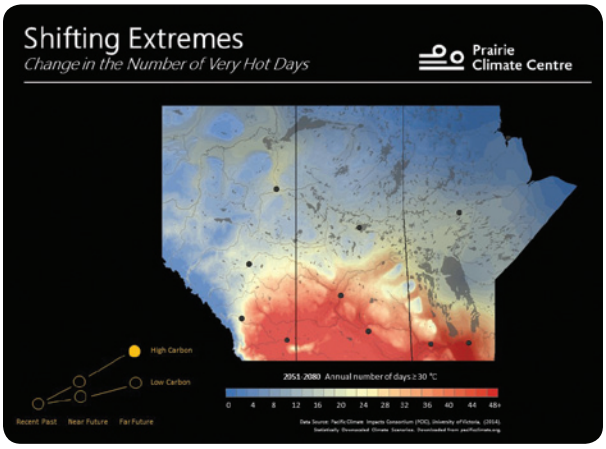
Manitoba commercial building sector organizations such as the Building Owners and Managers Association, Building Energy Management Manitoba and Canada Green Building Council, actively support energy efficiency in existing buildings. Based on the strength of their experience, the Manitoba government will also work with the sector to develop a strategy to meet the following goals by 2030:

- recommission 80 per cent of buildings that are not meeting high-performance energy standards
- undertake deep retrofits for 60 per cent of buildings to meet high-performance standards

Adaptation

Climate change poses real and potentially significant challenges to our environment, economy and the social fabric of our communities. Many regions across Canada have experienced extreme weather events such as flooding, drought, blizzards, hurricanes, tornadoes heat waves and wildfires. These extreme weather events are becoming more common and more severe. The expectation is that this will continue into the future.

According to work developed by the Prairie Climate Centre at the University of Winnipeg, there are real risks for Manitoba, especially associated with increasing temperatures, changes in precipitation, and negative impacts on communities, infrastructure, the economy and nature. Climate change is not just an intangible and far-off issue. Every indication is that it's happening now and will increasingly become more challenging.



The damage caused by record-breaking extreme weather can be costly. Private insurers have paid out billions of dollars over the past years for losses caused by natural disasters. These amounts are up to 10 times what was paid out even a decade ago. These ultimately result in higher customer premiums. Governments have paid out even larger amounts in disaster payments and repairs to infrastructure. The Fort McMurray wildfire is estimated to exceed $8.8 billion in financial, physical, social, health and environmental losses. Here at home, the 2011 spring flood in Manitoba cost the government $1.2 billion and costs continue to rise with recent flooding in the past few years. This is money taken from other priorities such as health care and education.

Extreme weather and the damages and social costs associated with it, should be seen as a warning sign of things to come. Adapting to a changing climate is becoming the new normal. We need to prepare for and take action in response to actual or anticipated climate impacts to minimize their adverse impacts on our economy, environment and the communities in which we live.

Adaptation is about becoming stronger and more resilient in the face of climate change risk. It means investing today for tomorrow.

Adaptation refers to taking action now to reduce the impacts of current and future climate change events such as floods, droughts and wildfires.

The following initiatives are currently being considered to support the Adaptation keystone. Your comments, ideas and suggestions related to this keystone and its proposed initiatives are valuable to government. Please consider sharing your views online at: **www.manitobaclimategreenplan.ca**.

Climate Knowledge

Understanding how Manitoba's climate is changing and how that might impact us is essential. This knowledge strengthens our ability to plan and make informed decisions about what actions we need to take.

Prairie Climate Centre – The Prairie Climate Centre is a joint initiative of the International Institute for Sustainable Development and the University of Winnipeg. The centre provides governments, businesses, non-government organizations and sectors with reliable climate data and information, enabling them to make informed decisions on addressing climate risk management and adapting to climate change. The Manitoba government has already invested over $400,000 to support this Made-in-Manitoba research organization. This centre is ready-made to become the regional climate services centre for Western Canada.

Manitoba Centre for Sustainable Agriculture – There is an increasing need to build capacity for agriculture-related climate change research that supports agricultural production, decreased emissions of greenhouse gases, enhanced sequestration of carbon in soil and greater resiliency to extreme weather. The Manitoba government is considering options to support the creation of such a research centre to provide this support

with the involvement of industry, universities, non-governmental organizations, farmers, and agriculture sector.

Indigenous knowledge – There is a recognized need to bridge traditional Indigenous knowledge with science-based approaches, particularly as it relates to impacts on nature and the continuation of sustainable traditional hunting, fishing and other food gathering activities. The Manitoba government will explore options to help ensure that Indigenous knowledge is incorporated in the implementation of the Climate and Green Plan.

Preparedness Planning – Planning to address climate-related risks to critical infrastructure, such as roads and buildings, electricity lines and structures, and waste systems and water control assets, is something all communities should undertake. As well, improved disaster risk assessments, and planning and response measures can help build capacity to respond to climate-induced events and emergencies. Having local communities undertake this assessment with on-the-ground knowledge can help them prepare for a changing climate.

Sustainable and Climate-Ready Communities

Manitobans live in communities — those spaces and places where we settle, work, raise families and share our time with others. We all have an interest in keeping them safe, healthy and well-functioning. Ensuring they are resilient to climate change and offer sustainable living choices must be a priority too.

Human Health – Climate change can impact our health. Extended periods of heat and cold pose dangers to the vulnerable in our society. Smoke and dust from drought and wildfires affect the air we breathe. And floods can contaminate drinking water sources. The Manitoba government is aware of the potential effects of a changing climate on human health and is open to ideas and solutions from communities and organizations on how to best address these concerns.

Climate Resilient Communities – We can design our homes, communities and cities to be more resilient to a changing climate. Examples include:

- creating more permeable water-absorbing surfaces to reduce the cost of drainage infrastructure or the spread of contaminated runoff

- collecting rain runoff from buildings and capturing it in rain gardens
- managing storm water with engineered wetlands and stands of trees
- planting native drought resistant plants in the landscape
- promoting natural shorelines to support better water quality
- increasing green spaces in urban areas
- Smart design can help us mitigate climate impacts and become more resilient to a changing climate.
- Your ideas and suggestions on how the Manitoba government can best support these efforts are welcome.

Sustainable Agriculture

When it comes to agriculture, climate change will likely bring mixed effects, most negative but some positive. For example, canola acres could be negatively impacted by climate change in Manitoba whereas soybean and corn acres will likely be positively impacted by climate change (at least initially), since canola is more sensitive to heat stress and excess moisture than soybeans. Canola will continue to be an important feedstock for cleaner biodiesel fuels, an alternate use that may grow more in the years ahead.

Increased acres of peas, in support of the recently announced Roquette pea processing plant in Portage la Prairie, will reduce the demand for nitrogen fertilizer in our province. Increased acres of soybeans being grown will do the same.

Sustainability in agriculture is also about sustainability in farming practices. Big data is arriving on farms everywhere now. Precision agriculture is a means to more efficiently and effectively utilize technology to farm, saving money and the environment.

Precision farming:

- collects and uses farm machine-generated data to characterize crop economic and environment budget scenarios across different management zones
- develops a precision business plan for a roadmap to build the precision agronomic plan that maximizes profit, and optimizes environmental performance
- evaluates different approaches for unprofitable acres

Satellites, drones, combines and tractor sensors allow for significantly increased abilities to access and utilize data for better on-farm management of input costs and crop yields. This more advanced analysis included looking at:

- cover crop type
- disturbance levels
- biomass levels as they relate to carbon sequestration
- continued monitoring of carbon cycle in project fields

Taking advantage of these new opportunities for Manitoba agriculture must be a real priority.

Jobs

Sustainable development brings the economy and environment together. We need to focus on how to prosper through climate change and create new jobs and growth in the transition to a global low-carbon economy. Environmental services and clean technology are opportunity sectors for Manitoba companies. We have strengths we can build upon. Addressing climate change is a major challenge, but it can present new opportunities for growth. Developing a green and prosperous economy includes a focus on creating decent jobs for all Manitobans in existing and emerging sectors. A Made-in-Manitoba Climate and Green Plan must also be about jobs, growth and prosperity. Carbon pricing and green investment will send critical signals to business that there is economic value in reducing emissions with certainty that they can plan their investments around.

Innovation and Cleantech

Innovation in all sectors will help Manitoba adapt as we address economic, environmental and social challenges. We are in a time of global economic transition to a low-carbon economy. Manitoba has a robust environmental and cleantech sector that employs over 60,000 private and public sector workers in 457 businesses throughout the province, generating approximately $2.5 billion in revenues in 2015. But the world market is much bigger, projected to grow to $2.5 trillion in 2020 and $3.8 trillion by 2030. Seizing this opportunity means we must invest in cleantech research and development innovation and commercialization.

What is Cleantech?

Cleantech refers to clean technology industries. While definitions vary, there is a fairly widespread consensus that these industries are expanding and that they apply advanced technologies to enhance performance and reduce the carbon footprint of residents, industry and the communities. Examples of cleantech industry sectors include renewable energy generation and efficiency, recycling and waste, as well as air, soil and water management and remediation. Environmental industries are closely associated with cleantech industries.

This provides a solid foundation we can build upon to create clean, green economic opportunities, support low-carbon growth and innovation, attract new investment and improve economic competitiveness. Approaches could include:

- building and strengthening early-stage clean technology innovation and research and development
- accelerating clean technology commercialization and growing Manitoba's commercial capacity in clean technology
- fostering clean technology adoption
- building private and public sector linkages and collaboration for development and export success
- removing barriers in policy and regulations that hinder R&D and innovative ideas
- aligning provincial and federal cleantech support programs
- creating new markets domestically for Made-in-Manitoba cleantech

Clean innovation can be advanced in any sector of the economy, from traditional resource sectors to manufacturing to services. It helps the environment now while producing new pools of jobs.

The following initiatives are currently being considered to support the Innovation and Cleantech keystone. Your comments, ideas and suggestions related to this keystone and its proposed initiatives are valuable to government. Please consider sharing your views online at: www.manitobaclimategreenplan.ca.

Green Tape Reduction

Innovation faces financing, commercialization and regulatory obstacles as it proceeds from idea to market. Evidence suggests many of these barriers occur at later-stage development as innovation moves from (a) research (b) development (c) demonstration (d) deployment, and (e) diffusion. Cleantech innovation can face even more. The Manitoba government will undertake a review of government policies, laws and programmes with a climate change and environmental lens to identify green tape market, regulatory and administrative barriers to investing and growing a green, low-carbon economy. This could lead to an eco-fiscal policy reform that could include:

- making green tape reduction a formal, ongoing part of the government's Red Tape Reduction exercise
- undertaking sector-by-sector reviews of policies, regulations and administration that stand in the way of business support program take-up by the environmental industries sector
- removing environmentally harmful subsidies and tax exemptions
- creating better federal and provincial program alignment on policies and business support programs

Opportunity Clusters

In a globally competitive economy, it is important that smaller jurisdictions focus on where they can most succeed. These are opportunity clusters of private and public sector advantage. Manitoba's agricultural sector is an obvious one. Water services is another in the environmental services sector. Identifying our top opportunity clusters based on competitive advantage, public and private sector linkages (particularly with universities, colleges and research institutions), and investment and commercialization readiness, would help build critical mass and leverage public and private resources in a more effective way.

A Green Economy

The United Nations Environment defines a green economy as one that results in improved human well being and social equity, while significantly reducing environmental risks and ecological scarcities. In its simplest expression, a green economy is low-carbon, resource efficient and socially inclusive.

Financing and Investment

A key obstacle to cleantech growth and innovation is access to financing by small and medium-sized enterprises. We need to unlock private sector investment in this area. This means eliminating barriers that hold back investment such as green tape and inefficient business support programs. Government can use targeted financial tools to stimulate private sector investment and strategic government spending. Encouraging new ideas, growing local businesses and finding success in export markets requires a coordinated effort. We have to find more effective ways of linking and leveraging public and private sector partnerships.

The following initiatives could be considered to support the Financing and Investment keystone. Your comments, ideas and suggestions related to this keystone and its proposed initiatives are valuable to government. Please consider sharing your views online at: **www.manitobaclimategreenplan.ca**.

Green Growth Capital

The Manitoba government could establish a Clean Technology Financing suite that leverages provincial and federal programmes for innovation, new business development, growth and export to address environmental challenges in Manitoba and beyond. As part of a larger Made-in-Manitoba investment and capital strategy, the government is reviewing current programs and incentives to ensure they work more effectively while considering new, private sector-led ideas.

Such an approach could include the concept of Green Bonds, which seek to attract private and institutional capital for major projects with defined environmental benefits, such as green strategic infrastructure, to help create new jobs.

Improving Uptake on Business Programs

The Manitoba government currently offers a range of business support programs that are theoretically available to the environmental industries sector. Yet, actual uptake of these programs by the sector is low. Raising awareness of these opportunities would make sense and facilitating matchmaking could increase participation in them. Participation could be enhanced by streamlining administrative application procedures to reduce the business costs of application time and effort.

Promoting Manitoba

Manitoba's clean, green advantage can be a strong driver for low-carbon growth. Companies are increasingly making investment and location decisions based in part on clean energy access. The Manitoba government could partner with the private sector, the federal government and research organizations in the marketing of made-in-Manitoba products and services that showcase our clean energy advantage. Regional and international collaborations, such as trade and investment missions, could be strategically undertaken to address issues and opportunities that support our success in clean energy and sustainable development.

Skills and Training

The low-carbon economy will require an evolving set of new knowledge and skills. We need to make sure Manitobans, particularly young and Indigenous Manitobans are prepared for these new opportunities. Job changes and adjustments can be expected as the global low-carbon economy emerges. Existing workers will need to acquire new knowledge and skills, too. Linking private sector opportunities with educational and training approaches can help bridge opportunities so our province is better positioned to win in this low-carbon economy transition.

The following initiatives are currently being considered to support the Skills and Training keystone. Your comments, ideas and suggestions related to this keystone and its proposed initiatives are valuable to government. Please consider sharing your views online at: **www.manitobaclimategreenplan.ca**.

Green Youth Corps

The Manitoba government could align its youth job opportunity programs into a focus on sustainability. There is also the chance to participate in the Canada Green Corps run by the United Nations Association of Canada. The programme provides four to six month work-integrated learning experiences for unemployed or under-employed youth between 18 and 30 years of

age to help their employers reduce their environmental footprint and increase sustainability. This type of meaningful employment can prepare the next generation with relevant skills for a low-carbon future, while stimulating the local green economy.

Co-op Opportunities and Experiential Learning

Co-op training is an effective way to provide practical job experience to a young person while exposing companies and industries to valuable learning in exchange. Several training support programs for youth are currently offered by the Manitoba government. Assessing them for creating longer co-op opportunities — such as a full semester — could make them even more effective in providing young, talented labour for Manitoba companies.

Education and Training

The Manitoba government could work with the private sector to develop a Clean Growth Talent Plan as part of a new Labour Market Strategy incorporating a focus on climate and sustainability jobs and skills. This could include:

- supporting the development of knowledge and skills needed for the adoption, installation and maintenance of clean technologies, including in Indigenous and Métis communities
- assisting businesses, institutions and communities to adapt to climate change
- building stronger business leadership and management skills to lead companies to rapidly grow and export clean technologies
- targeting young Manitobans and Indigenous Peoples for these opportunities

The Manitoba government could work with Manitoba's schools, universities, colleges and institutes to strengthen the alignment of Manitoba's education and training systems with the knowledge and skills needed now and into the future for climate change and the green economy.

Infrastructure and Adaptation Training

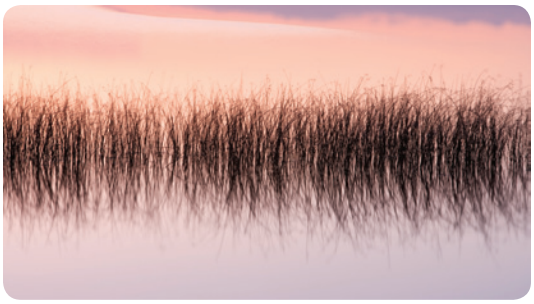
The Manitoba government is considering options for working with engineers and other partners to deliver capacity-building training and skill development programs. Such programs would allow for climate-ready, evidence-based, decision-making tools to be developed for engineers and other infrastructure planning decision makers, especially at the local level. This will encourage integrating the impacts of a changing climate into the full lifecycle of infrastructure, including design, planning and management.

Green Infrastructure

Green infrastructure is a source of new jobs and economic growth. As we invest public revenue in new projects to address climate and sustainability issues, we can ensure priority is attached to important needs like wastewater, drainage, dams and flood outlets.

Nature itself can be used to provide important services for communities by protecting them against flooding or excessive heat, or helping to improve air, soil and water quality. When nature is harnessed by people and used as part of infrastructure, it is called natural infrastructure. Green and natural infrastructure occurs at all scales. It is most often associated with storm water management systems, which are smart and cost-effective. Thinking of green infrastructure as a broader concept, serves to provide an ecological framework for the social, economic and environmental health of our surroundings.

Natural and Green Infrastructure



Natural and green infrastructure refers to an approach to providing services, such as water treatment or flood protection in a more natural way that both protects and enhances the natural environment and offers a variety of co-benefits. For example, instead of building a traditional water treatment plant or water retention structure, the enhancement of a wetland could provide the same services while also serving as important habitat for a variety of species.

The following initiatives are currently being considered to support the Green Infrastructure keystone. Your comments, ideas and suggestions related to this keystone and its proposed initiatives are valuable to government. Please consider sharing your views online at: **www.manitobaclimategreenplan.ca**.

Federal, Provincial, Municipal Dedicated Funding

A changing climate poses increased risks to Manitoba's critical infrastructure systems, including the roads, bridges, buildings, power lines, water control structures, and water and waste treatment facilities that help ensure a high quality of life for all Manitobans. As such, infrastructure design, planning and management needs to take into full account both recent and future climate conditions, including extreme events.

The Manitoba government could work with its funding partners to ensure a sustained dedication of new funding for identified green infrastructure project priorities. This would enhance the resiliency of our infrastructure to withstand climate change pressures.

Flood control infrastructure should be a key priority in this area.

Natural Infrastructure

Nature has its own defences and methods for preserving and regenerating its natural state. We need to harness this. Efforts should be made to increase the use of natural systems such as wetlands to filter wastewater from treatment facilities and reduce and filter local overland flooding to reduce nutrient-laden runoff. Trees and plants assist in soil stabilization and reduce the need for and expense of hard engineered solutions.

A green infrastructure approach views the natural environment from a functional perspective and seeks to put in place mechanisms that protect communities and safeguard critical natural areas.

We would work with communities and the agricultural sector in particular, to identify prospective natural infrastructure projects for support.

Infrastructure Resiliency Assessment and Best Practices

The Manitoba government is considering options for assessing the current level of resiliency of our public infrastructure assets to a changing climate, and developing cost effective options to further prepare and withstand future extreme events. This could include assessing best practices, such as natural infrastructure alternatives like wetlands, green roofs, riparian zones, and trees that provide more enduring resiliency to extreme events such as floods and droughts.

Riparian zones are the transitional zones that are found along streams, rivers, lake shores and wetlands. Often described as wetter than dry, but drier than wet, these areas support unique wildlife and plant communities. Healthy riparian areas have many important functions in our watersheds.

Water

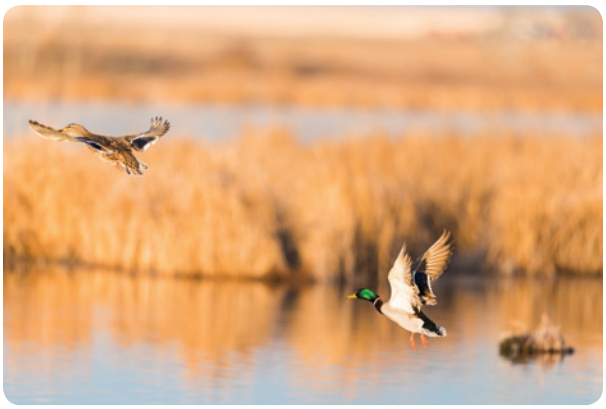
Manitoba is a province with abundant water. We have 900 trillion litres of surface water that covers approximately 16 per cent of the province. We are a land of 100,000 lakes, including Lake Winnipeg, which is the 10th largest freshwater lake in the world. Its drainage basins, or areas that flow into it, are over 40 times larger — 1,000,000 square kilometres in size and home to more than seven million people — and bring water from four other provinces and four states into it.

In Manitoba, there are strong links between a changing climate and the health of our lands and waters. These in turn are linked to the health of our people and communities. Initiatives to address overall water management, water quality and water supply (flood and drought) are required as we move forward with addressing climate change in Manitoba.

Wetlands and Watersheds

Water flows through many different types of landscapes across Manitoba. The activities done on these landscapes and others that border us, influence where and how water flows, the quality of water in our lakes, wetlands, rivers and streams, and the water we drink. The interconnection between land and water activities is easiest to understand in the context of individual watersheds — the geographic areas of land where all water drains to a common point. Groups of smaller watersheds form large drainage basins, like the Assiniboine River Basin or the Red River Basin, for example.

Watersheds are widely recognized as the most effective unit on which to plan, coordinate and manage activities that influence water. Water doesn't respect political boundaries; in Manitoba water flows between municipalities, traditional lands and into and out of other provinces and across the international border. A healthy watershed helps foster a healthy community. It provides safe drinking water, allows for food production and provides natural areas for people to enjoy recreational activities. By strengthening our focus on managing water and activities that influence water on a watershed basis, we can more effectively address beneficial management on an ecosystem basis, where it matters most.



The following initiatives are currently being considered to support the Wetlands and Watersheds keystone. Your comments, ideas and suggestions related to this keystone and its proposed initiatives are valuable to government. Please consider sharing your views online at: **www.manitobaclimategreenplan.ca**.

Watershed Planning

The Manitoba government currently uses an integrated approach to watershed planning that balances multiple perspectives and needs. The resulting plan becomes a tool that supports action and decision making by all players on the landscape. Watershed plans are long-range planning documents that help identify actions that can be taken today to improve water quality, foster biodiversity, store carbon in the natural environment, adapt to changes in weather patterns, and build resilience to climate related risks. A watershed-based approach leads to better drainage and water retention, protecting and restoring valuable wetlands, and improved watershed resiliency in the face of floods, drought and extreme weather events.

Manitoba is fortunate to have an existing network of local organizations that are already delivering important ecological goods and services and managing water in local watersheds. With over 40 years experience in land and water management, conservation districts are well positioned to play a key role in managing our watersheds. They provide the local institutional capacity needed to readily adapt to changing local conditions. With the right tools and strategic partnerships, these local boards can evolve to play an important role in coordinating landscape activity and delivering ecological goods and services to improve watershed resiliency. The Manitoba government is consulting on ways to enhance the watershed planning and management framework at both the local and regional levels.

Wetlands

Wetlands are prime examples of a natural ecosystem that provides valuable ecological services. They filter water, store water when it is abundant and save it for when it is dry. They store carbon and provide shelter and food for a myriad of species including plants, insects and animals.

The Manitoba government has committed to a no net loss principle of water retention. This will require protection of wetlands across the province, building on the current policy by enhancing protection of seasonal, permanent and semi-permanent wetlands from drainage activities. While avoidance and minimization are the priorities, Manitoba will be exploring options for a mechanism to allow a more flexible and effective framework for mitigating wetland loss. Work will also continue to inventory wetlands across the province as part of a new policy approach.

No Net Loss means that the overall water storage capacity within a watershed will not be diminished. It is an approach that allows for necessary drainage but also requires retention so the overall impact of human activities is net neutral.

The Manitoba government, with the assistance of the Manitoba Habitat Heritage Corporation, has also developed a wetland assessment tool that can be used to consistently assess the ecological functions that wetlands provide to ensure that highly functioning wetlands are protected.

Agriculture and Land Use

The relationship between water and land is closely intertwined. Agricultural or municipal development land use decisions can straddle watersheds, impacting more than one watershed.

The type of agricultural practices and community development decisions we take as Manitobans can enhance our watersheds or hasten their degradation. Being informed about what are the best management practices helps all of us to protect our waters. Adopting beneficial management practices that maintain the health and viability of our watersheds is not only beneficial to the health of Manitobans and the environment but to our economy.

The following initiatives are currently being considered to support the Agriculture and Land Use keystone. Your comments, ideas and suggestions related to this keystone and its proposed initiatives are valuable to government. Please consider sharing your views online at: **www.manitobaclimategreenplan.ca**.

GRowing Outcomes for Watersheds (GROW)

Manitoba will implement a Made-in-Manitoba ecological goods and services program called GROW, based on the Alternative Land Use Services (ALUS) model. This new program aims to reduce flooding and improve water quality and nutrient management. It will be delivered in partnership with landowners, non-government organizations and federal and municipal governments. Projects implemented through GROW will help foster adaptation to climate change and improve watershed resiliency to climate-related impacts, such as flooding and drought.

GROW will also recognize the value of green infrastructure to contribute multiple ecological goods and services, while protecting Manitoba's other infrastructure from a changing climate.

Conservation districts illustrate an important partnership between the province and local municipalities to protect, restore and manage land and water resources on a watershed basis. Naturally, conservation districts will be a key partner in delivering GROW — Manitoba's ecological goods and services program.

Considerations on this approach will commence shortly.

Drainage and Water Retention

Tile drainage can help to manage water on agricultural land more effectively than other approaches by increasing sub-surface holding capacity. Benefits need to be balanced by mitigation for potential negative impacts on downstream flooding and water quality. As part of work on a new regulatory approach to drainage, consideration will be given to reduce barriers to tile application and to mitigation requirements to reduce negative impacts.

Water retention can achieve multiple benefits to agricultural landowners and communities in managing the impacts of drought and mitigating downstream flooding or nutrient runoff. Innovative approaches will be considered through farm-based and community planning and water retention structure approaches to fulfill no-net-loss of water retention capacity goals.

Flood and Drought

Manitoba can experience both flood and drought in the same year. These events are hard on Manitobans and on our economy. Since the droughts of the 1930s, the flood of 1950 and especially after the 1997 flood, and even the 2011 and 2014 floods, Manitoba has been increasing efforts to be prepared for such events through better forecasting, monitoring, response planning and infrastructure. Going forward, we need to become even more innovative and support the development of multi-purpose, multi-scale retention systems that allow water to be stored on the landscape, thereby reducing local flooding, and also providing extra water that can be distributed during times of drought. We also need to incorporate green infrastructure ideas that help increase resiliency to climate impacts, such as bio filters on sewage lagoons or flood water retention ponds to assist with irrigation during droughts.

The following initiatives are currently being considered to support the flood and drought keystone. Your comments, ideas and suggestions related to this keystone and its proposed initiatives are valuable to government. Please consider sharing your views online at: **www.manitobaclimategreenplan.ca**.

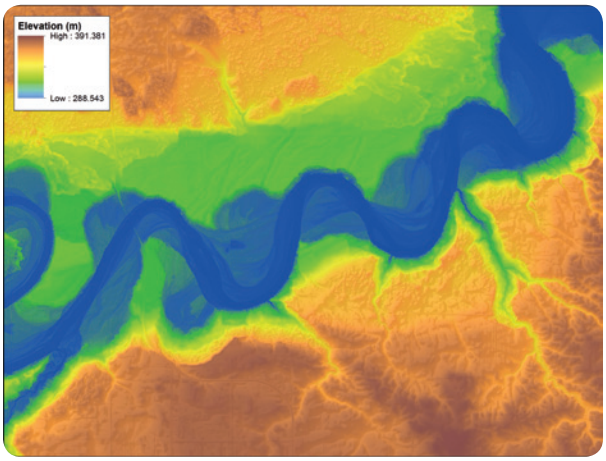
No Net Loss

As part of the integrated approach to watershed management, the Manitoba government has committed to a no net loss approach to water retention in watersheds. Keeping water on the landscape and managing it carefully assists our communities in being more resilient to a changing climate, including through flood and drought. Retaining water can also help to improve water quality.

Wetlands are a key part of Manitoba's water retention strategy. Also, through the integrated watershed planning process, the Manitoba government will conduct distributed storage studies to assist the agricultural sector, community decision makers, government and others in determining where and how to construct water retention structures for maximum benefit relative to cost. A pilot project has just been completed on the Roseau River watershed that identifies and analyzes 10 possible water retention projects.

LiDAR

LiDAR (Light Detection and Ranging) is a remote sensing technology which uses lasers to collect accurate, continuous elevation data, known as topographic data, over relatively large areas.



LiDAR data are used as a critical input to land and water management, including for flood risk mapping, delineation of watersheds and sub-watersheds, hydrologic modelling, water control infrastructure planning, flood mitigation and flood control infrastructure planning, water retention studies and land use planning. Manitoba will continue to leverage partners to complete LiDAR data collection for rural Manitoba.

LiDAR stands for "Light Detection and Ranging". It is a tool that uses laser sensors mounted on aircraft to create highly accurate elevation maps of the terrain.

Drought Defense

Drought has historically been the most costly of climate impacts on the Prairie economy. It is slow in its onset, but it can continue for long periods of time over widespread areas. It spirals through our economy from those who are first affected, such as farmers, then to equipment dealers to agricultural service businesses. The environmental impacts on land, water, fish and wildlife are also high, as can be the social and mental health impacts.

Understanding water availability and drought conditions and communicating them so people can make informed decisions is important. Expanded distribution of drought and water supply conditions information, including increased accessibility of up-to-date information through the Manitoba Drought Monitor website, helps to keep Manitobans informed and supports any required actions. Along with scientific monitoring, local and traditional knowledge needs to be incorporated to have a better understanding of the resiliency of the landscape affected. To increase collaboration and information sharing, Manitoba will establish and work with drought committees, including establishing regional drought committees to provide timely feedback from those out on the landscape.

The best way to protect Manitoba from the harsh impacts of drought is preparedness. Increasing the understanding of watershed and basin capacity and building preparedness through a variety of methods will help reduce the impacts of drought. A basin-by-basin approach to assessing preparedness is underway in tandem with the integrated watershed management planning process.

Water Quality

Good quality water that supports aquatic life, recreation, human consumption, agriculture, industry and many other uses is our expectation as Canadians. Unfortunately, water quality can be stressed by everyday activities and practices of people, communities and industry. That's why the Manitoba government is working with municipalities, farmers, business leaders and Manitobans to take action to protect our water quality.

The following initiatives are currently being considered to support the Water Quality keystone. Your comments, ideas and suggestions related to this keystone and its proposed initiatives are valuable to government.

Please consider sharing your views online at: www.manitobaclimategreenplan.ca.

Managing Excess Nutrients

Excess nutrients contribute to algae blooms in Manitoba's rivers and lakes. Algae blooms spoil drinking water, ruin beaches, lower property values, and damage fish and other aquatic life. Some algae produce toxins that can be dangerous to people, livestock and pets.

Algal blooms occur not only on Lake Winnipeg, one of Manitoba's greatest freshwater resources, but also on other lakes across Manitoba, including Killarney and Pelican Lakes, lakes in the Whiteshell Provincial Park, and others.

Algal blooms have a negative effect on our economy by decreasing tourism and over time, may reduce the productivity of commercial and recreational fisheries. Climate change will likely increase the frequency and severity of algal blooms when warmer temperatures contribute to longer ice-free seasons and warmer water temperatures.

Action to reduce nutrient loading to rivers and lakes will continue with increased focus on developing and implementing watershed-based targets for nutrient reduction, including for the Lake Winnipeg watershed.

Communities are important contributors to nutrient loading through wastewater treatment plants. Action to reduce nutrient loading through improved wastewater treatment, including implementing innovative solutions, will continue. Additionally, wetland protection commitments can go a long way to reduce nutrient loading off agricultural land.

Agriculture is a key land use in southern Manitoba. Manitoba will work with Keystone Agricultural Producers, conservation districts and other partners to implement beneficial management practices such as precision agriculture and those in the 4R program (Right time, Right amount, Right place, Right source) to help reduce nutrient loading.

What is Precision Agriculture?

Precision agriculture is about doing the right thing, in the right place, in the right way, at the right time, using new technologies, such as global positioning (GPS), sensors, satellites or aerial images, and geographic information systems (GIS) to assess and understand landscape variations. Precision agriculture allows for flexible application of inputs across fields and reduces the risk of over application.

An example of precision agriculture is variable rate fertilizer application, which allows a producer to:

- automatically deliver targeted rates of fertilizer to meet crop requirements.
- reduces the risk of over-application and overlap and improves fuel efficiency.
- improve efficiency of fertilizer applied.
- identify and adjust for environmentally sensitive areas.
- reduce the potential for non-point source pollution.

Water Quality Trading

An innovative method to improve water quality is through water quality trading. This applies a market-based approach that works alongside water quality regulation to improve water quality. Generally, a regulator sets an overall limit and allocates amounts of pollution or excess nutrient sources so the limit is not violated. The exceeding entities can then trade amongst themselves to meet the overall limits in the most effective manner. This means that a facility facing high related treatment costs can purchase equivalent reduction requirements from other sources at lower costs. For example, municipalities that are facing wastewater plant treatment upgrade costs to limit nutrient discharge could purchase credits from landowners who are willing to hold nutrients on their land through programs like GROW.

The Manitoba government will consider whether an innovative approach like water quality trading can improve nutrient reduction while supporting economic development.

Groundwater and Aquifers

Manitobans rely not only on high quality water in rivers and lakes but also below ground, in groundwater. Groundwater is used for irrigation, including for potatoes, livestock watering, food processing, horticulture, heating and cooling homes through geothermal installations, and providing drinking water to individual homes and communities. For example, up to 190,000 individuals rely upon between 50,000 and 80,000 private wells that supply water for domestic use to individual households. More than 200,000 people rely on groundwater-based municipal-public systems.

Precipitation and snow melt that recharges groundwater results in lower runoff and reduced flood potential. This water can be later discharged to springs and seeps, which provides baseflow to rivers, streams and wetlands during drier periods.

Recharge: All water that infiltrates the ground and enters the groundwater zone below the water table.

Runoff: Water from rainfall or snowmelt that flows across the ground surface instead of infiltrating the ground.

Baseflow: The portion of stream flow that is not runoff and results from seepage of groundwater. This is the primary source of running water in a stream during dry weather.

Groundwater is less susceptible to short and medium term droughts than surface water supplies. It creates resiliency in water supply from the variation in the amount and timing of precipitation and seasonal melt.

Recognizing the importance of groundwater, Manitoba will ensure that watershed management planning includes measures to protect groundwater and recharge areas. In areas where use of groundwater in a specific aquifer requires additional planning and management, aquifer management planning will be considered by working with all stakeholders. Groundwater mapping will be improved including, identifying flowing well areas and water quality concerns. These products are also important input to watershed, aquifer and basin planning.

Shoreline Erosion

Land that lies alongside rivers, lakes, streams, ponds and even man-made ditches is called a riparian zone or shoreline. The trees and vegetation along these strips of land provide important habitat for many kinds of wildlife and can represent the last line of defense against pollutants moving from ground and water.

Shoreline erosion is a natural process that occurs with wind, rain and wave action and can be accelerated by storms and natural loss of vegetation and trees. It can also be accelerated by human activity such as building too close to the water's edge, inappropriate armouring of shorelines and removal of vegetation and trees.

Maintaining shorelines is essential to preserving and protecting personal property, public safety and water resources.

Development in these areas can contribute to slumping or increased erosion. Building setbacks from water bodies for buildings are important to reduce liabilities for property owners, municipalities and ultimately taxpayers. Changes to precipitation resulting from climate change can increase seasonal variation of water regimes. This can impact soils and how they respond to our water flows, leading to increased sedimentation that reduces water quality or decreased stability of banks that support infrastructure like roads.

In response, the Manitoba government is considering establishing provincial guidelines to protect against shoreline erosion.

Drinking Water Quality

Manitobans expect safe, good quality drinking water. The impacts of a changing climate can pose risks to both the availability and quality of our drinking water. The Manitoba government uses a multi-barrier approach to protect our drinking water, focusing on the entire system from source-to-tap. As part of the integrated watershed management planning process, local plant operators meet with conservation district staff, municipalities and provincial drinking water officers to identify potential risks to drinking water sources and identify actions that can be taken locally to mitigate or eliminate those risks. Drought preparedness assessments completed in tandem with enhanced watershed planning processes can help local watersheds to identify potential vulnerabilities for drinking water sources in their communities.

Nature

Manitoba's central location in North America provides us with a great diversity of ecosystems, from the Prairies in the south to the Arctic coastlines in the north. We have inherited our abundant and unique natural heritage from past generations, and we are responsible for maintaining it in the present, as well as bestowing it in good health to future generations. Ecosystems provide benefits that are indispensible to the health and well-being of people and communities. Manitoba will undertake a series of initiatives that preserve nature, while also mitigating and adapting to the impacts of climate change.

Parks and Protected Areas

Manitoba is blessed to have over four million hectares of land and water set aside in 90 provincial parks, often just a short trip from home. Lush boreal forests, perfect prairie parklands, intriguing historic sites, sandy beaches, pristine lakes and crystal streams are ready for you to visit any time of year.

Parks serve many functions — they are places where Manitobans work, live and play, as well as places of cultural significance to Indigenous people. They may be places where people go to hunt, fish, gather food or harvest traditional medicines. Natural spaces can positively contribute to the well-being of people who enjoy them. Parks also have a critical role in conserving our biodiversity, as home to thousands of Manitoba animal and plant species. The Manitoba government strives to balance the ecological, cultural and economic values that our parks have for its citizens.

The following initiatives are currently being considered to support the Parks and Protected Areas keystone. Your comments, ideas and suggestions related to this keystone and its proposed initiatives are valuable to government. Please consider sharing your views online at: **www.manitobaclimategreenplan.ca**.

Provincial Parks System

The Manitoba government is committed to expanding and improving its parks system to meet the desire of all Manitobans wishing to appreciate nature and enjoy the outdoors, plus attract new visitors from neighbouring provinces, territories and states. New capital investments in campgrounds, water treatment facilities and recreation facilities would make our parks more attractive than ever to Manitobans and out-of-province visitors.

Recreational Trails

The Manitoba government works in partnership with Trails Manitoba and the National Trans Canada Trail (TCT) organization to support the development and promotion of a system of recreational trails across the province. Access to recreational trails encourages Manitobans to appreciate the natural environment and be more physically active, which supports both mental and physical health. In Manitoba, trails wind across the province through boreal shield, river-bottom forest, tall grass prairie, the Pembina Hills, western uplands and more. There are various types of trails and trail conditions throughout the province that are suitable for different types of activities. Recreational trails also encourage economic development and ecotourism.

Protected Areas Network

A network of protected areas that adequately represents all of Manitoba's natural regions plays an invaluable role in conserving biodiversity, ensuring healthy ecosystem functions are maintained, and providing resiliency in the fight against climate change. Whether it's a provincial park that sequesters carbon in its forests and peatlands, a wildlife management area that provides habitat to big game species, or an ecological reserve that contains bat caves and other unique features, protected areas all have a role to play in conserving nature.

Provincial Crown land is an important component of a network of protected areas; Crown land management ensures that lands provide natural habitat connectivity for wide-ranging species, store carbon, and maintain valuable ecological processes.

The province is reviewing its network of protected areas, working in partnership with local residents, indigenous groups, and stakeholders, to ensure that an adequate level of protection is achieved for the long-term viability of species and habitat.

What is a Protected Area?

Protected areas prohibit, through legal means, logging, mining (including aggregate extraction), and oil, petroleum, natural gas or hydroelectric development. Protected areas with this minimum level of protection still remain open for activities such as hunting, trapping or fishing. As well, protected areas respect First Nation's rights and agreements such as the Manitoba Treaty Land Entitlement Framework Agreement.

Areas that contain rare or sensitive habitats can be set aside as ecological reserves with greater restrictions on uses and activities so the natural region features for which they are set aside endure for future generations. National parks also have high levels of protection based on federal legislation, mandates and agreements. Similarly, private landowners using conservation agreements can protect their land to these levels of protection if they wish.

Other activities that significantly and adversely affect habitat are also excluded in certain circumstances. Activities such as intensive agriculture, and urban or major recreational developments are avoided when establishing protected areas.

Connecting with Nature

Manitobans have long had a strong emotional connection to the land. Whether camping, hiking, bird-watching, hunting, fishing or collecting medicinal plants, spending time outdoors is a great way to appreciate the beauty of our province and the need to protect and conserve it.

Some ways this could be promoted include:

Ecotourism

Manitoba has a wealth of ecotourism opportunities available for residents and visitors alike — from prairie birding trails, to boreal wildlife viewing opportunities, to northern adventures on the Hudson Bay coast. With enhanced funding for tourism now provided by the Manitoba government, prospects for ecotourism could grow.

Hunting and Outfitting

Hunting is an important means of managing wildlife populations, an important source of food and a long-standing tradition among many Manitoba families. Subsistence hunters depend on harvests of land and marine wildlife for food, as well as for cultural definition and social connection. The outfitting industry is a source of employment in northern communities, and provides both resident and non-resident hunters with hunting opportunities in beautiful natural locations.

Encouraging safe and sustainable hunting practices and traditions is part of making this both more secure and appealing to new generations of Manitobans.

Wild Species and Habitat

Manitoba's wild plants and animals, and the habitats on which they depend, face significant challenges from climate change, disease, invasive species and human activities. The Manitoba government will continue its efforts to maintain and enhance wild species and habitats through a series of initiatives.

The following are currently being considered to support the Wild Species and Habitat keystone. Your comments, ideas and suggestions related to this keystone and its proposed initiatives are valuable to government. Please consider sharing your views online at: **www.manitobaclimategreenplan.ca**.

Wildlife Management

Manitoba's wildlife species, both plants and animals, are being impacted by climate change, as well as other human-induced changes. Big game species in particular are facing significant challenges. Additional resources could be provided to ensure that wildlife is protected and managed in a sustainable manner.

Actions under consideration to better manage wildlife include undertaking effective and innovative surveys of big game species (to better understand current population status and trends) and developing comprehensive harvest co-management strategies in consultation with First Nations, Métis and licensed hunters and anglers (to give local communities a greater voice and ensure long-term sustainability of our wildlife populations).

Supporting Angling and Sustainable Commercial Fisheries

Maintaining sustainable fisheries is critical for subsistence users, for recreational anglers, and for commercial fishers looking to meet consumer demand for sustainably harvested fish. Fisheries are managed through the use of quotas, mesh size of gill nets, fishing seasons and regulations on the number of fishers licensed. These tools allow fish populations and the industry to remain viable, and also ensure that the domestic needs of treaty and Aboriginal rights-based fishers and their communities are met.

Commercial fishing has been a valued industry in Manitoba for over 100 years, with annual sales of $30 million, almost all of which is sold out of the country. While most commercial production comes from Lake Winnipeg and Lake Manitoba, several smaller lakes in southern and northern Manitoba are also fished.

Recreational angling has an economic value of over $400 million, according to a Travel Manitoba study, and has province-wide economic impacts.

The Manitoba government will continue its efforts to ensure that its fisheries are sustainable, and will develop a credible strategy to secure certification of Manitoba's commercial fisheries to meet demands for sustainably harvested fish.

Species at Risk

While most plant and animal species are abundant and healthy in Manitoba, a growing number of species have declined over time to the point of needing special protection. At present, species that have been designated at risk under provincial legislation include polar bear and boreal woodland caribou in the north, and several plant and animal species that make their home in prairie grasslands.

Manitoba is committed to supporting efforts to conserve species at risk, working collaboratively with landowners, non-government conservation organizations, Indigenous peoples, the federal government and other provinces and territories, to assess, monitor, protect and recover these vulnerable species.

Controlling Invasive Species

Invasive species are species that have been introduced into new ecosystems. They are able to spread rapidly because of their high reproductive rates and the absence of natural predators, competitors or diseases. In North America, species such as zebra mussels, invasive carp, leafy spurge and emerald ash borer are expanding their ranges due to human activity and climate change. Invasive species can have negative economic, social, environmental and human health implications. Control or eradication is very difficult.

Some invasive species carry disease, pose a powerful trigger for hay fever and other allergies, transform green spaces and water bodies, and change landscapes used by humans. Indirect effects could include:

- infestation of ecosystems rendering them less able to provide important ecosystem services that support human activity
- crop devastation
- disturbance of aquatic life and therefore the healthy contributions of plants and fauna to aquatic ecosystems

Manitoba will continue the fight to keep new invasive species from becoming established — and to keep those that are already here from spreading — through collaboration with neighbouring jurisdictions, awareness campaigns and aggressive control measures. We have already had success in managing invasive carp at Delta Marsh.

Forests and Natural Areas

Although Manitoba is considered a Prairie province, about half of Manitoba's land base is forested. Manitoba's boreal region, the province's single largest ecosystem, is a highly diverse landscape, made up not only of forests and grasslands, but also of enormous quantities of fresh water in lakes, rivers and wetlands. Boreal wetlands are critically important components of the boreal region, serving as natural water purification and storage systems, and as carbon sinks that mitigate the effects of climate change.

In addition to providing habitat for biodiversity, forests and natural areas are home to thousands of Manitobans who make their living from the land and resources in these areas. Careful balancing of these interests is required to ensure that all sustainable development principles and practices are followed.

The following initiatives are currently being considered to support the Forests and Natural Areas keystone. Your comments, ideas and suggestions related to this keystone and its proposed initiatives are valuable to government. Please consider sharing your views online at: **www.manitobaclimategreenplan.ca**.

Forest Vulnerability Assessment

Manitoba's forests face many risks under a changing climate, such as increased damage from fires, insects, droughts or reforestation failures. To prepare and adapt, Manitoba has tested a Climate Change Vulnerability Assessment framework in some forests of the province. Completing further assessments will identify possible vulnerabilities, but more importantly it will identity potential solutions to ensure our forests stay resilient to a changing climate.

Shelterbelts and Afforestation

A shelterbelt is a plantation pattern usually made up of one or more rows of trees or shrubs planted in such a manner as to provide shelter and reduce wind speed up to a distance of 20 times the height of the shelterbelt, reducing the effects of erosion in times of drought. Roadside shelterbelts (less than 30 metres from the road) trap blowing snow and reduce the possibility of blizzard-like conditions. This creates safer winter driving and significantly reduces the burden of road maintenance. Shelterbelts with a variety of tree and shrub species provide habitat for birds and other animals.

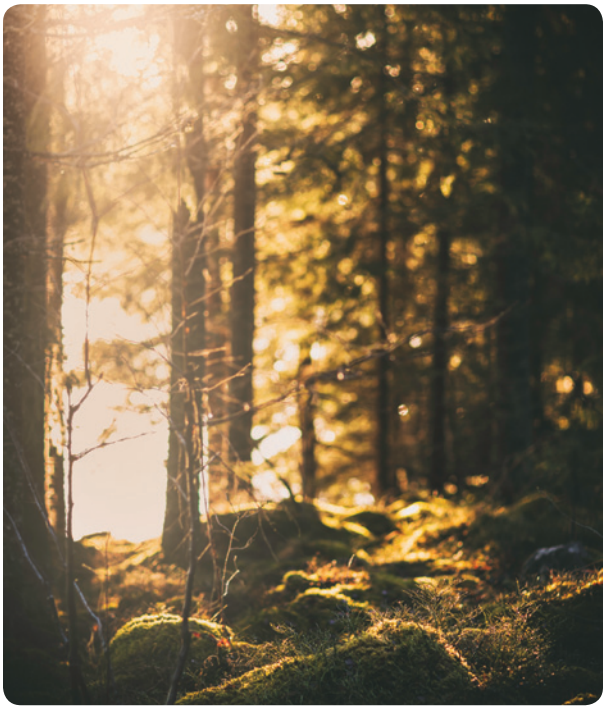
A riparian vegetation buffer can stabilize eroding banks or shorelines of adjacent water bodies, provide physical separation of agricultural activities from sensitive aquatic areas, protect water quality by acting as an organic filter, supply diverse food and cover for upland wildlife, and improve aquatic and terrestrial habitats for fish, wildlife and other organisms. They also serve as carbon sinks, to mitigate the effects of climate change.

The Manitoba government is considering options for investing in shelterbelt and afforestation programming to increase the planting of trees as shelterbelts in rural Manitoba and adjacent to major transportation corridors. We intend to work with conservation districts and other important stakeholder groups to enhance our existing approach.

Wildfire Prevention and Preparedness

Manitoba's changing climate is expected to produce more extreme weather events, including prolonged periods of drought and more severe thunderstorms, both of which would increase the frequency and severity of wildfires.

Enhancements to the Manitoba Wildfire Program are under consideration to better prevent and prepare for extreme fires like Alberta's 2016 Fort McMurray fire, which can seriously threaten human life and property. These could include implementing new technology, improving deployment of equipment and personnel, increasing public awareness of fire and smoke-related risks to safety and health, and developing mitigation measures to reduce the risks that fires pose to human safety and property.



Carbon Sequestration

Manitoba's forested and agricultural landscapes are not only important as wildlife habitat and sources of natural resources, but are also significant sinks that are able to sequester carbon and help prevent damaging levels of CO_2 concentrations in the atmosphere that cause climate change. In a low-carbon world, this brings added value and importance to protecting these areas and managing them to secure this growing benefit. Wetland and grassland conservation, rotational grazing, cover crops, and zero-till farming practices are good for soil health and climate resilience. This is all part of sustainable agricultural and forestry practice that contribute significantly to carbon sequestration in the province.

Soil carbon benchmarking and monitoring would be a useful first step in assessing the potential and value for more carbon sequestration. Analyzing the impacts of current and prospective land development activities is also needed. Manitoba currently utilizes many planning tools, including carbon account models, when assessing the impact of potential developments on Crown land forests.

On private and Crown lands, woodlot management plans enable private land holders to set out management practices for their wooded and forested land in rural Manitoba in ways that balance conservation and economic development. Woodlot management plans could be modified to strengthen the focus on carbon sequestration and enhance measures for conservation, economic development and sequestration on both private and Crown forested lands.

Manitoba's potential sequestration level has been estimated by IISD at over 3 MT per year, 20 to 30 years from now. This would grow over time through a range of measures including wetlands, forestry, riparian buffers, minimum tillage, perennials, and cover crops.

Conservation

Conserving our environment and creating economic prosperity is at the heart of sustainable development. While we recognize the need to protect lands in perpetuity, we must also consider ways to use our natural resources to create jobs and prosperity. Manitobans understand both the importance of jobs and the obligation to maintain our natural heritage for future generations.

The following initiatives are currently being considered to support the Conservation keystone. Your comments, ideas and suggestions related to this keystone and its proposed initiatives are valuable to government. Please consider sharing your views online at: **www.manitobaclimategreenplan.ca**.

Boreal Wetlands Conservation Policy

All wetlands in Manitoba are important. However, boreal wetlands in Manitoba are often undervalued and unrecognized. Similar to legislated requirements to identify and protect provincially significant peatlands, there is a need for a unified policy approach that is inclusive of these important boreal assets and the valuable ecosystem, economic and societal benefits they provide, both locally and globally.

Development of a boreal wetlands conservation policy is an opportunity for Manitoba to show leadership in boreal wetland conservation and stewardship. In doing so, we must recognize the importance of the forestry, mining, peat harvesting, and infrastructure sectors to Manitoba's ongoing prosperity. We must always strive to strike a balance that conserves these wetlands without hindering ongoing and future economic opportunities.

A proposed boreal wetlands policy could be developed through public, industry and stakeholder engagement and education. The development of best management practices and a commitment to a no-net-loss approach for boreal wetlands could be cornerstones of the policy. Northern and other regional communities, Indigenous communities and resource management boards would be actively engaged to assist in developing our approach.

Value of Boreal Wetlands to Manitoba

Greater than 80 per cent of Manitoba's land base falls within the boreal zone. Of this, boreal wetlands comprise over 40 per cent of Manitoba's boreal zone and cover over 220,000 square kilometres. More than 75 per cent of the total inflow of water to Lake Winnipeg in Manitoba comes from the boreal zone. The Boreal Wetlands Conservation Policy will assist in mitigating the occurrence of nutrient loading from the boreal zone to Lake Winnipeg (and other water bodies), while providing for the continued sustainable development of Manitoba's boreal zone.

Best Management Practices

The development of best management practices (BMPs) for sustainable resource development in Manitoba's boreal zone could be developed through public, industry, Indigenous, and stakeholder engagement and education. An example could be the development of BMPs for the construction, operation, decommissioning and reclamation of resource roads and water and wetland crossings on Crown lands.

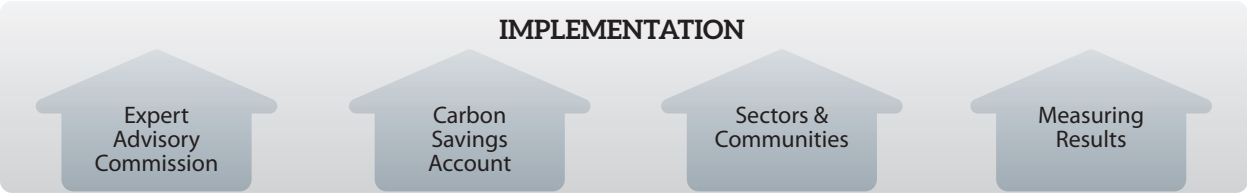
Conservation Trust

A conservation trust has the potential to provide significant financial support to efforts aimed at achieving the goals and objectives of our provincial climate strategy, particularly those related to conserving nature. Providing funding to Manitoba communities and community groups, non-government conservation organizations and academic institutions would allow for funds and resources to be leveraged from within and outside the province to generate real action on the ground. Experiences in other jurisdictions suggest that the multiplication factor may be up to three times the initial investment in terms of overall value. Dedicating a portion of ongoing carbon revenue, for example, could allow for stable funding of the trust.

Manitoba will review successful conservation trust programs in North America and beyond in consideration of establishing a similar program in Manitoba.

SECTION 6

Implementation



Too often, governments come up with plans that neglect the critical aspect of how they can be successfully implemented. This leads to cynicism and failure. We want to build implementation directly into the plan from the outset, and measure our progress as we go along and adjust as required. That's why Implementation is explicitly set out as part of the overall strategic framework in four key areas.

Expert Advisory Commission

This plan is part of a whole-of-government approach and, indeed, a whole-of-society effort. We must strive always to assess where we are, adapt to changing circumstances, and keep ourselves on track to a sustainable future. Ensuring ongoing input from knowledgeable and committed Manitobans will help us do just that.

To this end, the Manitoba government is proposing to create an "expert advisory commission" with an independent mandate to review our collective progress on the Climate and Green Plan, assist with its implementation and give needed advice on next steps. This commission should be formed from experts and stakeholders representative of the sustainable development community, namely: business, environment, sectors, Indigenous and other communities, and academe.

Bringing expert and committed Manitobans together ensures we have an ongoing Made-in-Manitoba solution.

Carbon Savings Accounts

Governments all over the country have set and failed to meet carbon reduction targets, contributing to frustration and cynicism about their intentions. Such targets are typically set far off in the future and the commitment needed to achieve those goals just hasn't been there.

Manitoba will take a different approach; one that fits our emissions profile, our early investments in clean hydroelectricity, and our Made-in-Manitoba carbon pricing and targeted emissions reductions model.

The goal must be actual, ongoing emissions reductions, not a false distant target never to be achieved. Part of this problem has been a rigid focus on a one-off GHG reduction target, rather than focusing on the stock of carbon pollution going into the atmosphere each year. It is these cumulative emissions that are stockpiling in the atmosphere and causing climate change. One year's reduction in emissions helps, but does little to alter long-term warming and climate impact trends we are experiencing. Our focus should therefore be on consistently reducing cumulative emissions over time. It is 'bending the emissions curve' once and for all. This is a more tangible, results-driven approach to tackling climate change that works. It is a focus that the United Nations Intergovernmental Panel on Climate Change (IPCC) and UK Climate Change Committee recognize:

> *"The idea of measuring climate change as a function of cumulative CO2 emissions has emerged in the past five years as a simple and effective tool to understand and quantify how global temperatures respond to human emissions. In particular, 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."*
> *IPCC*

> *"Furthermore, 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."*
> *UK Climate Change Committee*

What are Cumulative Emissions?

It is common to measure and report greenhouse gas (GHG) emissions on an annual basis. But given that many GHGs persist in our atmosphere for decades or even centuries it is very important to understand that such emissions have a cumulative impact on the climate. Globally, we are releasing more GHGs in the atmosphere than can be absorbed by natural systems. This builds up over time. An analogy is that of allowing a steady number of cars onto a bridge, but letting very few cars off on the other side. At some point, the cumulative weight is too much for the bridge. Thus, when developing policies to address GHG emissions, it is important to consider the impact of cumulative emissions, not just annual emissions.

This approach also has the added value of recognizing that economies grow and contract. As our economy grows, we must double-down on reducing emissions for which we are responsible and can reduce. As our economy contracts, we can monitor the amount of reductions required in response knowing we will make it up in the future.

Starting in 2018, Manitoba proposes to be the first province in Canada to establish a carbon savings account process with designated five-year carbon savings account periods. Each account period will be given a specific amount of cumulative emissions reductions to achieve. A debit measure will be taken at the close of each period to be applied to the subsequent carbon savings account period to make up any shortfall. Any shortfall in emissions reductions from one carbon savings account period will be added on to the next period to be made up there. Each period will see accelerating reductions in carbon emissions ensuring the overall goal of ongoing emissions reductions is maintained. But these will be measured along the way so we can adjust and compensate, not at the end when it is too late to make up the difference.

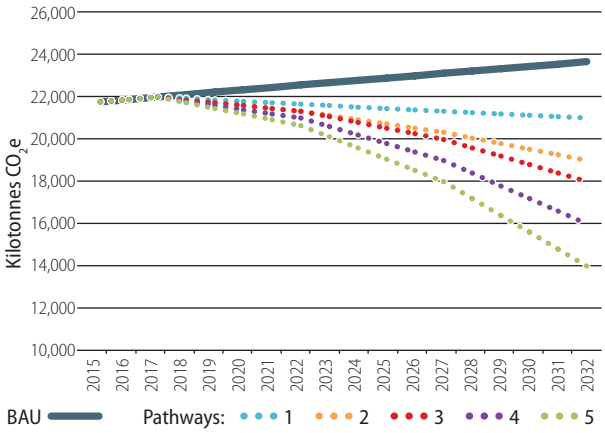
Manitoba's first five-year carbon savings account will run from 2018-2022. Subsequent accounts will follow in 2023-2027 and 2028-2032. Government would set each five-year carbon savings account based on the National Inventory Report compiled by Environment and Climate Change Canada containing prior-year results and forecasts, as well as advice from the new Expert Advisory Commission.

Each carbon savings account period will see a reduction in emissions from what is projected. It will bend the carbon curve in a meaningful and effective way to make actual progress we can count. In the end, it will result in actual emissions reductions that can be measured and contribute to Canada's overall climate goals.

Each year, Manitoba's carbon savings account would ensure we are emitting less and less carbon pollution into the atmosphere from business as usual (BAU).

Here's an illustrative example of how it would work:

Manitoba Five-year Carbon Savings Account Options



Total Cumulative Emissions Reductions (CER) Under Various Pathway Options

Carbon Savings Account Pathway	Carbon Savings Account	2032 emissions	% Change from Business as Usual (BAU)	CER over 15-year period from BAU
1	1 MT-1MT-1MT	20.95 MT	-11.3%	-21.5 MT
2	2MT-3MT-4MT	18.95 MT	-19.8%	-34.2 MT
3	2MT-4MT-6MT	17.95 MT	-24.0%	-38.8 MT
4	3MT-6MT-9MT	15.95 MT	-32.5%	-51.5 MT
5	4MT-8MT-12MT	13.95 MT	-40.9%	-64.2 MT

Sectors and Communities

Sectors and communities across Manitoba have a key role to play in our proposed Climate and Green Plan. All have a vital contribution to make in reducing emissions and helping Manitoba become more sustainable.

For the key emissions and industrial sectors in Manitoba, our approach will bring them directly into the decision-making process through ground-up participation. As part of developing and implementing five-year carbon savings accounts, sectors will be brought together through Manitoba Sustainable Development and the Expert Advisory Commission to consider what steps can be taken to develop individual sector plans and reduce emissions. Together, these will be "rolled up" as part of determining each carbon savings account target. That way, Manitoba's emission reductions will be based on actual achievable goals.

Communities have a critical role to play in achieving the goals of this plan. Communities are the place where we live, work, raise families and engage with others. They are also the places where the impacts of climate change are most felt and decisions are most immediate and effective. Local action and sustainability decision making makes sense for a whole lot of reasons. Local communities can have a better understanding about what needs to be done and how best it can be done. Local solutions add up to bigger results as communities learn and engage with each other. And local decision-making can be more effective and less costly than through big government programs. We will take a community-based approach in many aspects of this overall plan.

The City of Winnipeg is developing its own climate change action plan. The Partnership for the Manitoba Capital Region is engaging in this issue at the local community level. Integrating and coordinating measures across provincial, city and community plans would lead to greater results for everyone.

For all Manitobans, regardless of which community they live in, acting sustainably is about lifestyle choices. Manitoba's climate and green plan must involve all of us. We can, with the right information and the right incentives, make good choices for the environment every day. This is everybody's business — not just government's, or industries', or a few committed Manitobans. We all eat, play, move, use water and resources, and create waste. There is always a greener choice to consider in our everyday actions.

Not-for-profit agencies are important contributors to local and provincial action on sustainability and climate change. They work with municipalities to help develop climate adaptation plans. They work with schools and the public on climate change and sustainability education. They are an important and cost-effective resource that we can utilize more as part of this Climate and Green Plan. This plan envisages doing just that.

Together, we can all help ensure that Manitoba is Canada's cleanest, greenest and most climate-resilient province. This is what we all want for Manitoba and Manitobans.

Measuring Results

Spending public money must lead to measurable results. And getting results requires measuring progress along the way. The Climate and Green Plan proposes to establish a series of key indicators for each of the 16 keystones to help guide our progress.

Manitobans need to see, especially with carbon pricing, that emissions reductions will occur and that public investments in water, nature, and infrastructure can lead to tangible sustainability outcomes including growth and jobs.

The pillars, keystones and proposed actions and initiatives in this Climate and Green Plan will help us achieve our vision of a clean, green and climate-resilient province. Here are some of the measures that we are contemplating as indicators of progress towards this vision. Your comments, ideas and suggestions on these proposed indicators are valuable to government. They will be taken into account when deciding on the final list of indicators. Please consider sharing your views online at: **www.manitobaclimategreenplan.ca**.

Clean Energy

EXPECTED RESULT:
- **More clean energy use in Manitoba**

POSSIBLE INDICATORS:
- Manitoba's annual fossil fuel consumption, as indicated by petajoules consumed (total or per capita basis)
- annual total or per capita natural gas consumption
- health related indicators, such as:
  - reduction in incidence of vector-borne diseases
  - reduction in reported cases or air-quality related cardio-respiratory illnesses

Carbon Pricing

EXPECTED RESULT:
- **Emissions reductions due to carbon pricing**

POSSIBLE INDICATORS:
- reduction of reported emissions in Manitoba attributable to the carbon price, as indicated by litres of gasoline and diesel sold annually
- ratio of Manitoba's GDP to annual total litres of gasoline and diesel consumed
- annual increase in adoption of alternatives (e.g., ratio of gasoline to electric vehicles purchased)
- economic competitiveness impacts by sector such as exports

Sector Emissions Reductions

EXPECTED RESULT:
- **Overall emissions reductions for Manitoba and in identified sectors**

POSSIBLE INDICATORS:
- Manitoba's annual total CO_2e emitted
- Manitoba's annual per capita CO_2e emitted
- specific sector emissions reductions
- Manitoba government emissions footprint
- amount of CO_2 sequestered

Adaptation

EXPECTED RESULT:
- **Increased climate resiliency in Manitoba**

POSSIBLE INDICATORS:
- number of local governments with climate adaptation plans
- number of local governments with emergency management programs in place
- number of communities with emergency preparedness/response plans
- number of local governments with drought and flood structures in place
- a measure of prevented loss in dollar terms, as indicated by a ratio between dollars spent on adaptation initiatives to dollars saved from responding to or compensating for climate-related impacts
- dollars invested in green infrastructure project aimed at increasing protection against climate impacts
- number or percentage of provincial infrastructure projects designed with climate resiliency considerations

Innovation and Cleantech

EXPECTED RESULT:
- **Growth in the clean technology sector**

POSSIBLE INDICATORS:
- ratio of Manitoba's GDP to annual total GHG emissions (CO_2e/GDP)
- change in total revenues from the environmental and cleantech sector
- number of jobs and firms in the environmental and cleantech sector

Financing and Investment

EXPECTED RESULT:
- **Increased private sector investment in the green economy**

POSSIBLE INDICATORS:
- amount of private sector dollars invested in clean technology
- number of cleantech and environmental services firms accessing financing capital
- number of start-ups in this sector
- green tape reductions

Skills and Training

EXPECTED RESULT:
- **Increase in green economy jobs**

POSSIBLE INDICATORS:
- change in overall employment numbers
- increase in employment numbers by specific sector and industry
- number of environmental professionals and employees
- increase in available green job openings
- new educational programs offered at post-secondary training institutions
- enrolment in environmental-related courses and programs

Green Infrastructure

EXPECTED RESULT:
- **More green infrastructure projects**

POSSIBLE INDICATORS:
- change in number of and dollars invested in green infrastructure projects
- ratio of green infrastructure projects to total infrastructure projects, by number or dollar amount
- number of projects that use natural solutions such as bio-filters on sewage lagoons
- number of private and public projects that have eco-certification or forecasted climate change scenarios incorporated into design

Agriculture and Land Use

EXPECTED RESULT:

- **Maintenance and enhancement of our healthy agro-ecosystem**

POSSIBLE INDICATORS:

- production of agriculture products in concert with ecological goods and services
- hectares of natural capital (e.g., wetlands, riparian areas, grasslands, woodlands), conserved, restored and improved
- number and type of BMP implemented by watershed
- soil health
- environmental farm plans created or renewed

Watersheds and Wetlands

EXPECTED RESULT:

- **Healthy and sustainable wetlands and watersheds**

POSSIBLE INDICATORS:

- hectares of wetlands inventoried in Manitoba
- hectares of restored wetlands in rural Manitoba
- number of watershed plans create or renewed
- ratio of watersheds with watershed plans versus watersheds without watershed plans
- number of watershed-based distributed water retention studies completed
- number of acres (or percentage) of LiDAR capture across Manitoba
- acre-feet of water stored

Flood and Drought

EXPECTED RESULT:

- **Effective forecasting, mitigation, and response to flooding and drought**

POSSIBLE INDICATORS:

- number of watershed-based drought preparedness assessments completed
- number of water control structures used to enhance landscape features and manage water (volume of water stored or diverted)
- number of flood and drought-related calls to crisis lines
- proportion of at-risk communities with ring-dike protections
- proportion of regional health authorities and municipalities with flood and drought plans in place
- full cost of resources provided by Manitoba government to assist Manitobans during events
- number of communities protected to the design flood protection level (FPL)
- flood damages avoided through operation of water control structures
- reduction in agricultural losses to flooding (measured through Agri Insurance claims)
- reduction in private, municipal and provincial disaster financial assistance claims

Water Quality

EXPECTED RESULT:

- **Clean water throughout Manitoba for drinking, habitat, recreation, and economic development**

POSSIBLE INDICATORS:

- Manitoba's Water Quality Index, as published by the Canadian Council of Ministers of the Environment
- number of Manitoba communities under a boil water advisory that persist for more than one month
- number of watershed-based targets for nutrient reduction in place
- number of farms (or acres) using 4R practices for nutrient management
- number of wastewater treatment facilities with nutrient removal
- number of waterborne illness outbreaks
- number of recreational water exceedances

Parks and Protected Areas

EXPECTED RESULT:

- **Manitoba families who enjoy a greater connection with nature and natural tourism**

POSSIBLE INDICATORS:

- number of visitors to Manitoba's provincial parks, as indicated by the number of park passes sold
- annual economic value of ecotourism, hunting and outfitting

Wild Species and Habitat

EXPECTED RESULT:

- **Healthy wildlife populations and biodiverse ecosystems**

POSSIBLE INDICATORS:

- the population of (selected species e.g., moose, caribou, wolf, etc.) in Manitoba
- number of species listed at risk in Manitoba
- number of invasive species currently being tracked (under legislation, or with active control measures in place)
- the status of fish stocks as measured by comparing the commercial production of the most economically valuable fish species against maximum sustainable yield (MSY)

Forests and Natural Areas

EXPECTED RESULT:

- **Healthy and productive forests and natural areas**

POSSIBLE INDICATORS:

- amount of Crown forest and grassland cover in Manitoba
- annual number of trees planted (includes shelterbelts, reforestation, new forests)
- number of completed private woodlot management plans
- number of vulnerability assessments and forest management adaption plans completed

Conservation

EXPECTED RESULT:

- **Manitoba support for active conservation efforts**

POSSIBLE INDICATORS:

- number of hectares protected under conservation agreement or easement
- amount of restored habitat
- number of hectares of boreal wetlands conserved
- number of hectares in the boreal zone enhanced through Best Management Practices

Questions for Discussion

- What do you think about the proposed implementation elements?
- Which indicators do you think are best for measuring progress and results?

SECTION 7

Projected Emissions Reductions

The table below outlines initial greenhouse gas mitigation initiatives the Manitoba government is considering to reduce greenhouse gas emissions in the province and the range of projected emissions reductions that could result.

Initiative	Description	Estimated Cumulative Emissions Reductions (tonnes) 2018- 2022
Carbon Price	Flat $25 per tonne carbon price	1,070,000
5% biodiesel mandate	All diesel sold at pumps in Manitoba would be required to contain at least 5% biodiesel content.	360,000 – 431,000
Efficiency MB	A new stand-alone agency to reduce electricity and natural gas consumption in the province through innovative products and programs, including green heating and green buildings.	342,000
Organics Diversion	Establishing an organics diversion target of 100,000 tonnes and adopting measures to support the waste diversion target.	270,000
Coal Phase Out	Phasing out Manitoba's last remaining coal unit ahead of schedule.	45,000 – 187,500
HD Truck Retrofits	A heavy-duty (HD) diesel truck retrofitting rebate program.	150,000
ODS Recovery	Implementing measures to optimize management of end-of-life white goods containing ozone depleting substances (ODS) and halocarbons.	60,000
Electric Buses	Replacing 100 diesel city buses with clean electric buses.	47,000
Low Carbon Government	Adopting measures to reduce emissions in government buildings, transportation, and waste streams.	30,000 – 38,500
Agriculture Best Management Practices (BMP)	Supporting on-farm BMPs that reduce agriculture emissions.	16,750 – 33,500
Displacing Propane in Churchill	Displacing propane heating with electric heating in up to 200 Churchill homes.	3,000 – 6,000
TOTAL CUMULATIVE EMISSIONS REDUCTIONS (TONNES)		**2,393,750 - 2,635,500**
TOTAL NON-PRICING CUMULATIVE EMISSIONS REDUCTIONS (TONNES)		**1,323,750 - 1,565,500**

These projections are estimates only and will be refined as part of each Carbon Savings Account process with more detailed modelling considering their interactive effects and other economic factors.

SECTION 8

Moving Forward

As Minister of Manitoba Sustainable Development, I am pleased to seek the input of Manitobans into our proposed Climate and Green Plan. We want this to be a strong plan that works for Manitoba for many years ahead.

We have met with hundreds of Manitobans and dozens of organizations, businesses, and individuals to get us to this point. You have already helped shape this plan with your advice.

Now it is time for the government to present our proposed plan to all Manitobans and hear what you have to say.

Our plan has been written to allow you to offer your views as you read through it. Please go online to **www.manitobaclimategreenplan.ca** and give us your views and suggestions.

We will be meeting with environmental, business, community and civic society leaders and representatives to hear their thoughts on the plan.

Indigenous leaders and organizations will be invited to gain their very important perspective. The application of traditional and Indigenous knowledge can be a real boon to understanding and acting on environmental threats.

To maximize the input of as many Manitobans as possible, we have created a 'town hall kit' to assist you and friends in your community to offer your views. We want as many Manitobans as possible to have the chance to provide their suggestions.

Please let us know your views between now and November 30, 2017.

Strengthening Manitoba's environment and economy depends on all of us. Each of us has a role to play in growing our economy and protecting our environment.

Having a climate and green plan that works is 'job one' for a clean, green and climate-resilient Manitoba.

Please join us in making it happen.

Original signed by
Honourable Rochelle Squires

www.manitobaclimategreenplan.ca

Manitoba

QUÉBEC IN ACTION GREENER BY 2020

2013-2020

Climate Change

Action plan

PHASE 1

A PLAN FOR QUÉBEC

Québec

1131

1132

Legal deposit
Bibliothèque et Archives nationales du Québec, 2012

ISBN : 978-2-550-65192-5 (PDF)

© Gouvernement du Québec, 2012

Message from the Premier

With the launching of the 2013-2020 Climate Change Action Plan, Québec is reiterating its intention to remain a leader in North America.

Our determination to pursue our initiatives hinges on a deep-seated conviction that the fight against climate change is not only necessary to ensure our well-being and that of future generations but is also an opportunity for economic growth. More than a challenge to be met, the fight affords us an outstanding opportunity to redirect our economy toward clean energy and technologies, reduce our dependence on fossil energy, and ensure that Quebecers enjoy a healthy, prosperous future.

Confirmed leadership

Québec began the shift to a greener economy several years ago. The adoption in 2006 of an initial structuring plan, the implementation of the Québec Public Transit Policy and the Québec Energy Strategy 2006-2015, and the establishment of the Green Fund marked a genuine turning point in our fight against climate change. Today, Québec has one of North America's best per capita GHG emission rates. Innovative measures and alliances established with other governments active in the field have earned Québec recognition for its leadership, both in Canada and on the international scene.

Québec in action

We have adopted for 2020 an ambitious GHG emission reduction target of 20% below the 1990 level and we intend to maintain our commitment in the long term.

The 2013-2020 Climate Change Action Plan is the cornerstone of our strategic approach in the fight against climate change, to which other government initiatives are being added. Accordingly, our choices in the realm of sustainable mobility, land-use planning and energy are also at the forefront of our perspective of Québec society's development. They must contribute significantly to the attainment of our climate change objectives.

For this reason, to ensure an integrated, coherent approach throughout the public administration, the action plan will be reinforced in 2015 bearing in mind the new initiatives proposed in these fields. The action plan is intended to be flexible and focuses resolutely on 2020. It will also change in light of the development of climate science, new technologies and Québec's progress in the attainment of its objectives.

We have decided to establish a carbon market that will enable us both to financially support our ambitions and ensure that the carbon cost is systematically recognized in our individual, organizational and collective choices.

A plan for all Quebecers

The challenge that climate change poses will make it necessary to review certain practices and ways of doing things. The Québec government knows that it can rely on the vitality of all Quebecers, businesses and organizations in Québec society to support it in the shift that it has undertaken toward a green, prosperous, sustainable economy.

Jean Charest
Premier

Message from the Minister

Our government is proud to present the 2013-2020 Climate Change Action Plan, which will enable Québec to pursue its shift toward a green economy and to strengthen the resilience of Québec society to climate change impacts.

Build on past achievements

Through the efforts of the government and society as a whole, in 2009, Québec's greenhouse gas (GHG) emissions stood at 2.5% below the 1990 level. While this achievement is remarkable, it also fully reveals the challenge that subsequently awaits us.

Québec has targeted for 2020 a GHG emission reduction of 20% below the 1990 level, an ambitious target for a government nearly half of whose energy portfolio is already made up of renewable energies. We have chosen the target for the numerous benefits that will stem from the initiatives implemented to achieve it.

Reduce and adapt

Our initiatives focus primarily on the transportation, industry and building sectors because they account for the biggest portion of our emissions inventory and also have the biggest potential for reduction. In Québec, the attainment of the most significant gains depends on the enhancement of energy efficiency, reliance on clean energy sources and changes in our behaviour and ways of doing things. The first phase of the action plan is our roadmap for the coming years. Other Québec policies that have a major impact on climate change will round it out.

At the same time as we make the requisite effort to control and reduce GHG emissions, the action plan proposes government action that will protect even more the natural and built environment and contribute to reducing the vulnerability of current and future generations to climate change impacts.

An open-ended, entirely self-financing plan

The recently established GHG emission cap-and-trade system will give us the means to act. The sale of emission allowances to the businesses targeted, the main source of funding for the plan, will be rounded out by the extension until 2014 of the levy on fossil fuels. Having adopted a cautious approach to estimate the revenue available, we can rely with assurance on nearly $2.7 billion over the next eight years.

Starting in 2013, major industrial emitters will be subject to the system and, as of 2015, the transportation and building sectors will also be included. The second phase of the 2013-2020 Climate Change Action Plan will be launched in light of the revenue that the carbon market generates, the progress of our initiatives, and new policy directions governing sustainable mobility, land-use planning and energy.

All Quebecers in action

We are all concerned by the fight against climate change and the choice to act is ours. We are seeking easier access to mass transit and active transportation, more energy-efficient buildings, improved air quality and communities better prepared for changing climatic conditions. On the strength of Quebecers' support, through its visionary climate change action plan, Québec is moving toward a greener, more responsible world.

Pierre Arcand
Minister of Sustainable Development, Environment and Parks

1135

QUÉBEC IN ACTION GREENER BY 2020

Table of Contents

Foreword **1**

1 From science… **3**

…To action **4**

1.1 Québec moving forward towards 2020 and beyond 6

1.2 An action plan centred on complementarity and partnership 7

1.3 The choice of priorities for the CCAP 2020 9

2 Prepare for the future: ensure sustainable land-use planning, innovate, mobilize and lead the way to reduce our GHG emissions and adapt **10**

2.1 Ensure sustainable land-use planning – Québec communities at the forefront 10

2.2 Innovate – Develop knowledge and technology 12

2.3 Mobilize – Engage Quebecers and partners in action 15

2.4 Lead the way - Québec government commited to set the example 17

3 Reduce our greenhouse gas emissions in all sectors **20**

3.1 Establish a carbon market 21

3.2 Foster the sustainable mobility of individuals and goods 22

3.3 Support Québec firms in the transition to a low-carbon economy 26

3.4 Foster the emergence of sustainable buildings 27

3.5 Contribute to the development of sustainable agriculture 30

3.6 Link the environment and the economy in the management of residual materials 31

3.7 Capitalize on Québec's renewable energy potential 32

4 Strengthen Québec society's resilience to climate change impacts **35**

4.1 Maintain the health of individuals and communities 35

4.2 Preserve economic prosperity 36

4.3 Strengthen the durability and safety of buildings and infrastructure 38

4.4 Preserve biodiversity and the benefits that ecosystems offer 39

5 Stay on course: coordination, follow-up and accountability **41**

6 Advancing to the 2020 target: data **44**

7 Conclusion **53**

Appendix **54**

Foreword

This action plan is the cornerstone of Québec's strategic approach to climate change. It presents an array of tools that will contribute to the attainment of Québec's objectives with respect to greenhouse gas (GHG) emission reduction and adaptation to climate change impacts. The action plan is not the only means at Québec's disposal to attain its objectives, far from it: other strategies, policies and key directions will bolster its efforts in the coming years, in particular in the areas of transportation, land-use planning and energy.

One of the key measures in the action plan consists in establishing a GHG emission cap-and-trade system in the context of a North American carbon market. It leads to a price signal linked to carbon in the economy, which encourages GHG emission reductions. The sectors that the market covers account for 85% of Québec's emissions. It will also enable the government to benefit from substantial revenue generated by the sale of GHG emissions allowances. Such revenue is conservatively estimated at nearly $2.7 billion by 2020. It will be fully reinvested in measures focusing on the reduction of emissions and adaptation to climate change in Québec, thereby fostering a transition toward a greener economy and society that are more resilient to climate change.

The carbon market in Québec has been designed to achieve GHG emission reductions on the order of 20% below the 1990 level on the North American market. However, since the carbon market extends beyond our borders, it does not guarantee that all of the emission reductions will be achieved within our territory. The challenge is, therefore, to ensure that the reductions are achieved in Québec, bearing in mind the significant benefits stemming from them. To this end, the priorities identified in the CCAP 2020 propose incentives to make even more advantageous emission reductions in Québec, both for businesses and for individuals, communities or the Québec economy overall.

The 30 priorities pinpointed in the CCAP 2020 and the attendant initiatives mark the first phase of this open-ended plan. They should lead to reductions on the order of 6.1 megatons of the estimated 11.7 megatons required between 2013 and 2020 to achieve entirely within Québec the GHG emission reduction target.

The CCAP 2020 will be reassessed at midpoint to ensure the efficiency of the measures proposed in it. Moreover, depending on changes in the price of a ton of GHG on the carbon market, revenue from the carbon market could exceed $2.7 billion. Accordingly, in light of the additional budgets available, other initiatives aimed at further GHG reductions will be added under the second phase of the CCAP 2020.

The attainment of Québec's objectives regarding GHG emission reductions and adaptation to climate change requires the mobilization and commitment of all key stakeholders in Québec society in the municipal sector, industry, private-sector businesses or community organizations. The CCAP 2020 serves, in this regard, as a catalyst that provides the tools necessary to facilitate the general mobilization. Each of us is responsible for acting to reduce our individual and collective carbon footprint and it is with the commitment of each Quebecer that we will do so.

1 FROM SCIENCE...

What science tells us

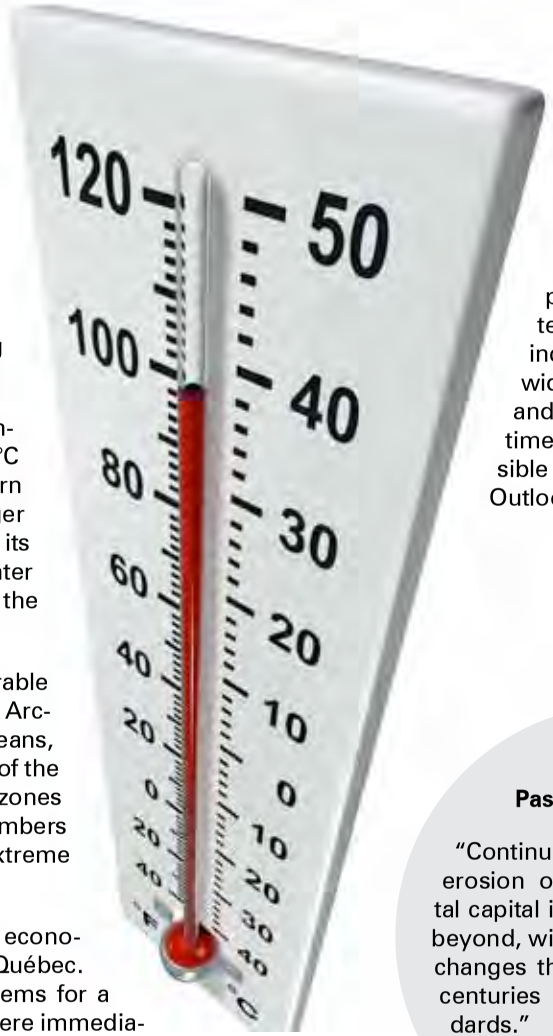
The reality of climate change is now well established. Average temperatures on the surface of the earth and the oceans have risen, leading to climatic disturbances that are already occurring in almost all regions of the world.

It is estimated that worldwide, average temperatures rose by 0.7°C in the 20th century. Furthermore, the past decade (2001-2011) was the hottest recorded by meteorological services and the warming now under way is accelerating (WMO, 2012).

Global warming is also already a reality in Québec. Average annual temperatures in southern Québec increased by 0.3°C to 1.5°C between 1960 and 2008. Snow showers increased in northern Québec but decreased in the south (MDDEP, 2012). In the longer term, Québec's climate is expected to grow warmer throughout its territory, especially during the winter. Accordingly, by 2050, winter temperatures could rise by 3.8°C in southern Québec and 6.5°C in the north (Ouranos, 2010).

Climatic change is already leading to numerous perceptible, measurable phenomena: the gradual disappearance of summer ice cover in the Arctic, accelerated melting of the glaciers, the acidification of the oceans, and so on. Climate modelling predicts a substantial rise in the level of the oceans that would have a devastating impact on low-lying coastal zones and island states in the fairly near future such that the youngest members of society will have to live with the consequences. More frequent extreme weather events such as flooding and drought are also anticipated.

Climate change will directly affect ecosystems, infrastructure, the economy and the well-being of populations the world over, including Québec. Past, present and future GHG emissions will disrupt climate systems for a long time to come. This means that even if worldwide emissions were immediately stabilized and reduced, climate change will continue to affect us for decades to come.



Beyond the gradual impact anticipated because of rising average temperatures around the world, the Intergovernmental Panel on Climate Change (IPCC) estimates that global warming of over 2°C above temperatures in the pre-industrial era exposes us to the risk of abrupt, irreversible changes (tipping points) in the functioning of climate systems. To limit global warming to a maximum increase of 2°C, the IPCC estimates that worldwide GHG emissions must be stabilized by 2015 and be halved before 2050. In short, there is still time to act but the time window in which it is possible to do so is rapidly dwindling (World Energy Outlook, 2011).

Past gains threatened

"Continued degradation and erosion of natural environmental capital is expected to 2050 and beyond, with the risk of irreversible changes that could endanger two centuries of rising living standards."

OECD, 2012

...TO ACTION

The Québec of tomorrow?

Some anticipated impacts on Québec in the coming decades with high human, ecological and economic costs…

- the increased frequency and intensity of extreme weather events in the south (flooding, heavy rain, drought), which will compromise public safety, the security of infrastructure and endanger crops;
- the gradual disappearance of annual sea ice in the Arctic, which will affect the ways of life of the Aboriginal peoples and ecosystems;
- accelerated melting of permafrost in the Arctic, which will lead to the instability of buildings and infrastructure such as roads and runways;
- epidemics of pests and forest fires, which will threaten public safety and cause losses for the logging industry;
- extreme low water levels in the St. Lawrence Seaway, which will hamper navigation and put at risk the availability of drinking water and water quality;
- a shorter snow season, which will curtail the activities of the Québec winter sports industry;
- an increase in the distribution range of human disease vectors, e.g. Lyme disease;

… but also a number of potential benefits in certain sectors

- a reduction in the number of heating degree-days and household energy bills;
- potential tourism development in certain regions;
- broader accessibility of certain northern territories through the opening of the Northwest Passage in the Arctic.

In the realm of climate change, Québec is acting simultaneously to:

- reduce its GHG emissions;
- strengthen its resilience to anticipated climate change impacts.

In so doing, we are participating in international efforts to solve the problem at the source by reducing our GHG emissions while minimizing the unavoidable impact that climate change will have in Québec.

If Québec has decided to make climate change a key priority, it is because the benefits of action largely outweigh the drawbacks both for individuals, businesses and communities.

Indeed, reducing our GHG emissions affords us an opportunity to review how we produce, consume and travel. We have the possibility to reinvent our society. The fight against climate change is synonymous with investments in energy efficiency, increased use of locally produced renewable energies, and the transition to a green economy. Correspondingly, Québec businesses and the Québec economy will be strengthened and become more competitive, which will have a positive impact from the standpoint of jobs and regional development. The development of products and technologies linked to climate change will also enable businesses to capitalize on new markets and export niches. Our collective and individual vulnerability to rising energy prices and, more specifically, to the price of imported oil, will be reduced.

Vision of the CCAP 2020

By 2020, Québec will have shown genuine leadership and have contributed to the worldwide effort to fight climate change by reducing its GHG emissions by 20% below the 1990 level. Through its initiatives, the Quebec government will have strengthened Québec society's resilience to climate change impacts and have pursued the transition to a green, prosperous, sustainable economy.

Indeed, while Québec is fortunate in being able to rely on its abundant hydropower resources, our society and way of life depend heavily on oil for work-related travel and leisure activities, the production and transportation of food and freight to consumption sites, mechanized agricultural production, and so on. Resolute reliance on energy efficiency and renewable energies is a winning strategy. Accordingly, in addition to the imperative to reduce the use of fossil fuels to curtail climate change, we also have an incentive to reduce our vulnerability to the availability of fossil fuels and increases in their price.

Individuals and communities can also achieve savings and enhance their quality of life through the numerous health and environmental benefits stemming from a greener economy. Today, following several years of climate change initiatives, we can conclude that Québec's leadership is bearing fruit.

That is why Québec set in 2009 an ambitious objective for 2020, i.e. to reduce its GHG emissions to 20% below the 1990 level. It is through the overall efforts of international stakeholders such as Québec that significant gains in GHG reduction can be achieved worldwide. We are also relying on our leadership among our partners.

In the same way, from the standpoint of adaptation, our immediate, concerted initiatives will avoid or minimize the human and financial costs stemming from climate change impacts. The well-being of our society, the soundness of our public finances and, indirectly, the leeway available to future generations to build their future are at stake. That is why Québec has also adopted the *Government Strategy for Climate Change Adaptation,* which targets the stakeholders and sectors that are the most vulnerable to climate change impacts.

Opportunities to be seized

As the United Nations Environment Program (UNEP) notes, the fight against climate change is being perceived increasingly as an opportunity rather than a burden and as an avenue to prosperity rather than an impediment to benefits and employment. The new green economy is leading to invention, innovation and imagination at an unprecedented level since the Industrial Revolution.

UNEP, Annual Report, 2008

The cost of inaction

"It is already very clear that the economic risks of inaction in the face of climate change are very severe…and the benefits of strong, early action considerably outweigh the costs… and must be viewed as an investment. If these investments are made wisely, the costs will be manageable, and there will be a wide range of opportunities for growth and development along the way."

Stern Report, 2008

Québec's commitment for 2020 pursues the *2006-2012 Climate Change Action Plan* (CCAP 2006-2012) adopted in the wake of the coming into force of the Kyoto Protocol. Through the plan, we have pointed the way to the attainment of our GHG reduction target for 2020. We have also taken important steps to give concrete expression to the vision that is guiding Québec regarding adaptation. Through the CCAP 2020, Québec is going further by setting a bold reduction target and adopting ambitious objectives pertaining to adaptation. The establishment of a carbon market will support the action plan overall. The revenue that the Québec government obtains from it will be invested in the priorities of the action plan. The carbon market is, therefore, an integral part of the action plan.

It is estimated that an initial amount of nearly $2.7 billion will be allocated to the CCAP 2020. Of this amount, $220 million will come from the extension until 2014 of the levy on fossil fuels. The carbon market will generate $2.445 billion in revenue, established according to the minimum price of carbon on the market, which is set by regulation. Additional revenue might be available bearing in mind the actual price of carbon on the market.

1.1 QUÉBEC MOVING FORWARD TOWARDS 2020 AND BEYOND

Intervening in a structuring, long-term manner

The GHG reduction target of 20% below the 1990 level and the Government Strategy for Climate Change Adaptation will guide Québec's initiatives until 2020. Beyond this timeframe, at a time when climate change impacts will be more acutely felt, we will have to go even further in our efforts to reduce GHG and adapt to climate change.

In this perspective, the CCAP 2020 emphasizes transversal initiatives that reinforce the short- and long-term scope of and spinoff from more sectoral measures, both from the standpoint of GHG reduction and adaptation to climate change. Specifically, the initiatives focus on:

- land-use planning and risk management;
- innovation and the development of knowledge, know-how and technology;
- awareness-raising and training;
- integration of a concern for climate change into the public administration and exemplarity.

Reducing our GHG emissions

To reduce its GHG emissions by 2020, Québec is investing in an array of initiatives that cover all sectors that emit GHG, first and foremost the transportation sector, but also industry and buildings. Niches with reduction potential will also be emphasized in other sectors such as residual materials, agriculture and electricity generation.

A COMPLEMENTARY APPROACH

Profile of Québec's GHG emissions in 2009

In 2009, Québec's total GHG emissions stood at 81.8 megatons of CO^2 equivalent, which represents 10.4 tons of GHG per capita, the lowest ratio in all of the Canadian provinces. Transportation accounts for 43.5% of Québec's GHG emissions and now ranks first among the heaviest GHG emitters. Three-quarters of the sector's emissions are attributable to road transport. Industry ranks second (28% of emissions), then the building sector (14%), followed by the agriculture (7.9%), residual materials (5.9%) and electricity (0.8%) sectors. Roughly 70% of Québec's GHG emissions come from the production and consumption of fuels. The remaining 30% of emissions come from non-energy sources, mainly industrial processes, refrigeration systems (HFCs), agriculture (the digestion of animals, manure management and farmland) and residual materials (the decomposition or incineration of organic waste and wastewater treatment).

Breakdown of Québec's GHG emissions in 2009 by industry sector

Industry sector	Sector's share in 2009	Emissions (MT of CO_2 equivalent)
Transportation	43.5%	35.57
Industry	28.0%	22.93
Residential, tertiary	14.0%	11.42
Agriculture	7.9%	6.45
Residual materials	5.9%	4.80
Electricity	0.8%	0.61
Total	**100.0%**	**81.79**

Source : MDDEP, 2011

Adapt Québec to climate change

From the standpoint of adaptation, Québec is also investing in several initiatives that will give concrete expression to a significant portion of the *Government Strategy for Climate Change Adaptation*. Several of the initiatives focus on the key challenges defined with respect to adaptation:

- the well-being of the population and communities;
- the pursuit of economic activities;
- the durability and safety of buildings and infrastructure;
- the maintenance of essential ecological services.

1.2 AN ACTION PLAN CENTRED ON COMPLEMENTARITY AND PARTNERSHIP

The CCAP 2020 ensures the leadership of the government's strategic approach to climate change. It is also clearly included in a sustainable development approach in keeping with the 16 principles defined in the *Sustainable Development Act,* and is serving as a guide for government choices overall that may affect the attainment of the objectives pursued. Several current or impending government strategies and policies that influence GHG emissions and Québec's ability to adapt to climate change round out the initiatives in the CCAP 2020. Mention should be made, in particular, of strategies and policies focusing on energy, sustainable mobility, sustainable development, residual materials, agriculture, public security, and health.

Accordingly, the initial phase of the CCAP 2020 introduces an array of measures that will enable Québec to take an important step toward the attainment of its climate change objectives. Impending government strategies and policies will round out the initiatives and will be taken into account when phase 2 of the CCAP 2020 is elaborated in late 2015.

A complementary strategic approach

- the Electric Vehicles Action Plan (2011)
- the Québec Residual Materials Management Policy (2011)
- the Québec Research and Innovation Strategy (2010)
- the Development Strategy for Québec's Environmental and Green Technology Industry (2008)
- the Government Sustainable Development Strategy (2008)
- the Québec Public Transit Policy (2006)
- the Québec Energy Strategy 2006-2015 (2006)
- the Policy Policy for Lakeshores, Riverbanks, Littoral Zones and Floodplains (2005)
- the Cadre de prévention des risques naturels (2005).

Concrete gestures by Quebecers, businesses, communities and Québec organizations, which will also contribute to reducing Québec's GHG emissions and mitigating climate change impacts, will round out the strategies and policies.

Growing synergy between government policies and the accountability of all of the stakeholders concerned by the problem will be essential to give concrete expression to the gains and changes necessary to attain the CCAP 2020 objectives.

Partnership is the mainspring of the CCAP 2020

The CCAP 2020 stems from a collaboration between the main government departments and bodies concerned with the fight against climate change, which have worked jointly to analyze the situation in each GHG emitting sector and in respect of adaptation to climate change. The expertise of over 100 organizations has also been profitably employed to define the key issues and priorities to be considered in the CCAP 2020.

The successful implementation of the CCAP 2020 requires the establishment of dynamic partnerships between the government and key stakeholders in Québec society. Accordingly, the Québec government is relying on the contribution from communities, which, through their power of influence over land occupancy and urbanization, are at the forefront of the fight against climate change. The government is also relying on the initiative and dedication of individuals and civil society to commit themselves, mobilize and take action to reduce our carbon footprint and collective vulnerability. It also acknowledges the essential contribution made by institutions and research organizations that are engaged in technological innovation, which are providing solutions to adaptation and developing and disseminating knowledge on climate change in our society. The private sector must be on the lookout for best practices in the realm of sustainable development in order to move resolutely toward a future that is less reliant on carbon, for the benefit of the economy and jobs. The attainment of the GHG reduction objectives must become a genuine societal project.

A willingness to work together and engage in consensus building with respect to climate change is emerging throughout Québec. The joint declaration signed by over 150 stakeholders representing municipal federations, municipalities, the RCMs, transportation companies, the RCEOs, NGOs, unions, and so on at the Forum québécois sur l'énergie held in 2011 is a striking example. The signatories acknowledge that Québec must resolutely commit itself to reducing its dependence on oil and make it the cornerstone of its GHG emission reduction strategy. They also undertake to carry out concrete measures in this respect. Le CCAP 2020 intends to build on this willingness to act in all regions of Québec and in all sectors.

1.3 THE CHOICE OF PRIORITIES FOR THE CCAP 2020

The 30 priorities of the CCAP 2020 make up a coherent, structuring whole, the choice of which was guided by the principles of sustainable development and by the scope of the contribution to the attainment of objectives respecting GHG emission reductions or adaptation to climate change. The following factors must also be considered:

- the preventive dimension and the sustainability of the initiatives and their impact;
- reinforcement of the internalization of costs;
- reinforcement of efficiency and economic competitiveness;
- the accountability of all stakeholders in Québec society;
- the coherence and complementarity of government intervention.

Among the criteria used to select priorities aimed at reducing GHG emissions, the cost per ton of GHG reduced or avoided was considered in order to maximize investments and the anticipated gains as regards climate change. However, account was also taken of the structuring nature of the investments and the attendant social, economic and environmental benefits. These criteria justify the choice of initiatives whose implementation cost per ton of GHG reduced is higher than that of others, while paving the way in the long term to decisive shifts in GHG emission reductions. This is true of the priorities focusing on intermodality in freight transportation, sustainable urban planning or the enhancement of industrial processes.

The priorities of the CCAP 2020 are varied. They include financial support measures such as grants or loans that shorten the period of return on investment (PRI) of GHG reduction projects both for businesses and for individuals. Certain priorities are of a regulatory nature. They usually complement the economic support measures and provide for a time limit to enable the market and individuals to prepare themselves.

Initiatives aimed at worker training, guidance for businesses, the acquisition of knowledge and technological development in all sectors covered by the CCAP 2020 are also included. Lastly, measures aimed at awareness-raising, citizen engagement and the education of young people round out the type of initiatives presented in the CCAP 2020.

Through their synergy, the priorities are spurring a gradual transformation of markets, practices and individual and collective behaviour. They will make Québec less reliant on carbon and more resilient to climate change impacts.

2 PREPARE FOR THE FUTURE: ENSURE SUSTAINABLE LAND-USE PLANNING, INNOVATE, MOBILIZE AND LEAD THE WAY TO REDUCE OUR GHG EMISSIONS AND ADAPT

In the realm of climate change, Québec is looking to the future beyond 2020. It is in this perspective that we are relying on certain key sectors to support sweeping medium- and long-term changes both in respect of GHG emission reductions and adaptation to climate change impacts: land-use planning, research and development, citizen engagement, and public administration.

Investment in these sectors will also broaden the scope of and spinoff from other sectorial measures devoted to GHG reduction and adaptation to climate change.

2.1 ENSURE SUSTAINABLE LAND-USE PLANNING – QUÉBEC COMMUNITIES AT THE FOREFRONT

With a growing footprint on the territory that persists from generation to generation, we must develop our living environments in a sustainable way. Decisions and initiatives pertaining to land-use planning significantly affect GHG emissions stemming from individual travel, construction and infrastructure maintenance but also the degree of vulnerability of Québec communities to climate change. Land-use planning is, therefore, a matter of priority both to reduce GHG emissions and adapt to climate change.

Québec's vision for land-use planning in the context of climate change

By 2020 and beyond, in particular through legislation and taxation that promote GHG emission reductions, Québec municipalities will have halted urban sprawl by hinging their development on densification near mass transit routes and the establishment of local services. Québec municipal bodies and communities have pinpointed their vulnerability and reduced their exposure to climate risks by integrating adaptation to climate change into their territorial planning and risk management.

In order to reduce GHG emissions, planning differently the development of our cities and towns implies, in particular, increasing their density near public transit corridors, consolidating existing urban and village cores, promoting local services and mixed usage. The application of these principles will reduce the distances to be travelled between the home, the workplace, businesses and the sites of leisure activities, thereby reducing individual travel needs. This area of intervention is important since urban sprawl in Québec has contributed to increasing GHG emissions resulting from the use of automobiles by increasing the distances to be travelled. Urban sprawl also makes it harder and costlier to extend mass transit systems. In order to reverse this trend, we must plan sustainable mobility in conjunction with land-use planning, and vice versa. In short, to coherence of government and municipal intervention in this respect is essential.

In addition to reducing the need for travel, properly organized urban densification limits at the source the need for additional infrastructure such as roads, water supply systems, sewers and public lighting while maximizing the use of existing infrastructure. This leads to lower construction and maintenance costs for communities and the attendant reduction in GHG emissions.

Land-use planning is also central to the process of adapting to climate change impacts. The choices that we are making today in this field will affect Quebecers' future well-being. They will have a significant impact on the level of risk for communities linked to climate change. Recent flooding and heavy rains and their consequences (flooded homes, the evacuation of residents) reveal that it is essential to integrate concern about climate change into current and future land-use planning practices and risk management. This will limit the consequences of and costs resulting from climate change.

Priority 1: Foster sustainable land-use planning of the territory in a perspective of combating climate change

Through the revision of the legislation respecting land-use planning and development, the government will define new policy directions aimed at the municipal sector that will reflect its willingness to act in the realms of climate change and sustainable development. The government policy directions will take the form of objectives and expectations to be considered in land-use planning and development plans not only with regard to GHG reduction but also in fields closely linked to adaptation to climate change, including the security of individuals and property, integrated water resource management, and the preservation and maintenance of biodiversity.

In order to guide the communities in this approach and the implementation of impending *Sustainable Regional and Local Land Use Planning Act*, the government will elaborate and make available to them tools, training and technical guidance. This will reinforce the coherence of government intervention that affects organization of the territory and land-use planning. Furthermore, the government will take steps to acknowledge exemplary municipal initiatives with regard to the sustainable development of communities.

The government will examine the potential of various tools, such as municipal taxation, which might facilitate the attainment of climate change objectives, e.g. by promoting urban densification, the consolidation of existing urban and village cores, and sustainable mobility.

Priority 2: Support municipal and community initiatives to reduce GHG, adapt to climate change, and engage in sustainable land-use planning

For several years, the government has financially supported through the Climate Municipalities Program municipal bodies that wish to take stock of their GHG emissions and elaborate an action plan to reduce them. The program has broadened knowledge of the sources of emissions in Québec municipalities and revealed the niches in which significant GHG reduction can be contemplated. The implementation of concrete climate change measures is now the priority of the CCAP 2020 to enable Québec municipalities to contribute actively to Québec's climate change objectives and also benefit from the numerous attendant advantages.

The Climate Municipalities Program will, therefore, be enhanced to more extensively guide municipal bodies in pursuing their approach. It will offer financial support to implement concrete GHG reduction measures in the sectors of activity that fall under their jurisdiction. In order to better take adaptation into account at the local and regional levels, the government will also provide support to enable them to pinpoint vulnerabilities in their territory with respect to climate change and to integrate them into their current planning.

Beyond the measures aimed at immediate GHG emission reductions, the Québec government will also support the municipalities that wish to invest in the sustainable development of their communities, in a context of climate change. Accordingly, the municipalities may benefit from financial support to design land-use planning tools and elaborate real estate or land-use planning projects bearing in mind climate change. The conception of sustainable development projects such as eco-neighbourhoods, the revitalization of town cores and central neighbourhoods, densification and requalification, and so on, will also be supported. Support for such projects will be subject to cross-compliance requirements such as density thresholds, functional mix and plant cover. Financial support may also be offered to implement targeted adaptation solutions with respect to urban drainage, e.g. porous pavement, grassed ditches, filter belts and green roof systems. These rainwater management measures will control inflows of water at the source in residential, commercial, urban and other environments. They also offer

worthwhile co-benefits from the standpoint of adaptation to climate change, in particular with respect to combating the impact of heat on health and the preservation of biodiversity in our living environments.

Account will be taken of the conditions specific to urban and rural environments when CCAP 2020 programs intended for the municipal sector are designed.

Priority 3: Promote risk management that minimizes the vulnerability of communities

To minimize vulnerability and strengthen Québec society's resilience, adaptation to climate change must be considered not only in land-use planning but also in risk management. For this purpose, the government will invest to immediately encourage the municipal sector and other stakeholders in civil security to take into account climate change in their activities.

To this end, financial support may be granted to municipal bodies and Aboriginal communities to enable them to intervene in their territories to prevent climate change-related disasters. Structural interventions such as the protection of homes or the displacement of infrastructure and buildings may also be supported when the risk of disasters related to climate change threatens public safety and the integrity of buildings and infrastructure.

In the realm of civil protection, certain systems are deemed to be essential since a service interruption, e.g. drinking water, electricity, telecommunications or roads, could seriously affect the health and safety of individuals and communities, the continuity of economic and government activities, and the preservation of natural environments. Some examples are transportation, power transmission or drinking water distribution networks. To avoid the occurrence of such interruptions, the government will pinpoint threats to these essential systems and establish solutions that will protect them and make them more robust. This will depend, in particular, on the strengthening of the national civil protection plan, which guides the government's response in the event of a disaster.

Since all risks associated with climate change cannot be reduced by prevention, it is important to establish preparatory measures that will enable us to intervene effectively when disasters occur. Québec will, therefore, adopt an early warning system that will strengthen the response capacity of communities in the event of a disaster. The system will quickly transmit warnings to communities at risk, alert them and provide them with advice on the procedures to be followed.

2.2 INNOVATE – DEVELOP KNOWLEDGE AND TECHNOLOGY

Research and innovation enable us to better understand our environment and find technical, economic and social solutions to the challenges that we are facing. They are essential against a backdrop of climate change.

Québec already has an array of programs and measures aimed at fostering technological research and development through various phases of the innovation chain. There are also programs that affect demand for technology, in particular in the realm of energy efficiency, biomethanization, and new processes. However, additional efforts must be made with regard to marketing, i.e. at the stage that follows demonstration, since experience has shown that technologies designed in Québec may find it difficult to complete this stage.

Québec's vision for research and development in the context of climate change

By 2020 and beyond, Québec will be a breeding ground for the development and implementation of new technologies and solutions pertaining to GHG emission reduction and adaptation to climate change. Knowledge of climate change impacts, vulnerabilities and cost-benefit analyses related to the implementation of GHG reduction and adaptation solutions will be available and the government and its partners will use them to make enlightened choices in the realm of climate change.

Moreover, although understanding of climate change and its impact has advanced considerably in recent years, there are still gaps in knowledge and know-how. Adaptation initiatives must be able to draw on the most reliable, recent knowledge to identify the threats that climate change poses to health, safety, the economy, infrastructure and the environment, and to pinpoint the optimum adaptation solutions. The acquisition of cutting-edge expertise in the study and modelling of the climate and better knowledge of its impact and society's vulnerability are essential preliminary steps to a properly planned adaptation approach and enlightened decision-making.

The CCAP 2020 will, therefore, pay special attention to research needs and the demonstration and marketing of Québec technologies that will allow by 2020 and beyond for GHG reductions and strengthen the resilience of Québec society to climate change impacts.

Priority 4: Support innovation and research and the development, demonstration and marketing of technologies aimed at reducing GHG emissions

Reliance on innovative technologies contributes to GHG emission reduction. Québec is already benefiting from an extensive network of universities and research centres. We must be able to stimulate such creative genius that will reinforce the contribution that the new technologies make to the fight against climate change. To this end, since research is the initial stage in the development of new technologies, the government will launch a call for research proposals aimed at reducing GHG emissions. The projects, carried out by universities or research centres, will satisfy the needs of businesses in different sectors of activity such as industry, transportation or buildings. Programs, chairs or specific research projects centred on more basic research or of specific interest to Québec will also be supported by the CCAP 2020, in particular in the realm of geological carbon sequestration.

Innovation is the means by which Québec can take its place in a world that is less reliant on carbon. Accordingly, Québec firms engaged in R&D that develop, demonstrate or market new technologies that significantly reduce GHG will be able to benefit from financial support. Québec expertise in technologies to reduce GHG emissions will thus be developed and contribute to the creation of new markets. Québec businesses that wish to test or adapt to their facilities new GHG reduction technologies will also have access to financial support when the development stage of the technology warrants such support.

In order to maximize collaboration between enterprises, researchers and the public sector, catalyst projects may be supported in certain fields, such as intelligent logistics.

Priority 5: Pursue the development of climatological monitoring networks

Climate-related monitoring and knowledge acquisition networks make it possible to assess the extent of climate change and are, therefore, necessary for the development of adaptation measures. A vast number of partners are increasingly consulting the data that the networks generate for various purposes: civil security, public health, agriculture, forestry, transportation, land-use planning, and so on. Investments will be made to ensure that the networks optimally cover Québec's territory in light of current and future needs, in particular with respect to air quality. The temporal coverage and type of data will also be enhanced. Beyond the actual networks, the CCAP 2020 will support the processing and dissemination of the data collected. Considering the more acute impact of climate change in the north, the climatic and geothermal monitoring undertaken in Salluit will be pursued and the northern network of meteorological and geothermal cable stations will be maintained to ensure the availability of reliable data on changes in the climate and the permafrost. Cartography of the permafrost will also be conducted in other Northern villages.

Priority 6: Support research in adaptation

The Ouranos Consortium, which already collaborated in the CCAP 2006-2012, will once again be asked to provide expertise and carry out the applied research projects required by the government departments and bodies concerned with planning adaptation to climate change.

Several other research centres are also contributing to the development of knowledge in the realm of adaptation. They, too, will be asked to carry out investigations to enhance knowledge of natural hazards related to climate change and an understanding of their impact, especially as regards civil security and transportation. As for infrastructure, the investigations will ensure its sustainability, pinpoint adaptation solutions and formulate new design, construction and operation criteria adapted to future climatic conditions.

Bearing in mind that the anticipated increase in temperatures in Québec will lead to conditions that are more favourable to pathogens and their conveyors, research in the field of public health will also be emphasized. Such research will focus on risk analysis, monitoring and the prevention of climate-related diseases. For example, studies will be conducted on wildlife species that promote the spread of pathogens such as Lyme disease likely to affect human beings. Funds will also be invested to develop monitoring technologies and to conduct studies on the health risks of zoonotic diseases and the efficacy of preventive measures. The greater health impact of air pollution and social inequality linked to climate change will also be studied. Lastly, the establishment of a virtual observatory on changes in adaptation in the health sector will be supported.

The Ouranos Consortium

Established in 2001, Ouranos is a Québec consortium that assembles some 250 scientists and professionals from various disciplines. Its initiatives focus on two key themes: climate science, and impact and adaptation. It conducts integrated research projects that combine the development of regional climate projections and the evaluation of the physical and human impact of climate change, while suggesting appropriate measures to prepare for and adapt to such change.

Contrary to biophysical or social impacts, the economic impacts of climate change have hardly been studied in Québec. The cost of climate change impacts and the benefits stemming from the implementation of adaptation measures are unknown in most sectors of activity. To remedy this situation, a research program will be established in collaboration with the Fonds de recherche du Québec. The program will focus on the socioeconomic impact of climate change in several economic sectors and the cost-benefit ratio of adaptation measures.

The Québec Arctic is facing specific climatic challenges. Accordingly, summary cartography of vulnerability in the Québec Arctic will be produced to respond to specific problems of management of the Arctic territory characterized by extreme climatic conditions, a specific hydrological context, and the predominance of permafrost, which is unstable in several ways. Such cartography is an essential prerequisite to the development of communities, business activities and any other form of use of the territory in the Québec Arctic. The cartography will be enhanced by operational recommendations that apply to development work or road and infrastructure construction.

2.3 MOBILIZE – ENGAGE QUEBECERS AND PARTNERS IN ACTION

Awareness of the numerous benefits of action in the realm of climate change and the existence of solutions that depend solely on our willingness in order to be carried out are a first step toward the active mobilization of all stakeholders in Québec society.

Québec intends, therefore, to adopt the means necessary to inform all stakeholders in our society of the state of knowledge on climate change worldwide and in our territory, the anticipated impact and the reduction and adaptation solutions available to us, including those that the CCAP 2020 is making available. Through our power of influence and ability to model our governance, production and consumption choices, each one of us can act to guide Québec society toward sustainable development. Participation in public debate to promote the recognition of climate change, the choice of local, low-carbon products or reliance on buses or bicycles for travelling between the workplace and the home are examples of concrete initiatives in the realm of climate change and sustainable development.

Québec's vision for citizen engagement in the context of climate change

By 2020 and beyond, Quebecers will be mobilized to contend with climate change and will have taken concrete steps to adapt to it and reduce their GHG emissions. Québec will remain a leader in North America in the realm of climate change. Its objectives will be ambitious and will implement means of action that are commensurate with its ambitions.

Civil society can play an important role in heightening awareness and further mobilizing all stakeholders in Québec society. Several organizations possess broad expertise on climate change issues and are able to enhance understanding of the phenomenon, propose avenues for intervention and act as catalysts to implement concrete initiatives.

Individuals in their role as citizens must not be overlooked. Each of their everyday gestures can make a difference and several government programs, including those under the CCAP 2020, are available to guide their desire to reduce their carbon footprint and better adapt to climate change.

Priority 7: Disseminate knowledge, know-how and solutions pertaining to GHG reduction and adaptation to climate change

In the wake of the CCAP 2006-2012, the government will step up awareness-raising among all stakeholders in Québec society to challenges and solutions in the realm of climate change.

Specific training, awareness-building, knowledge transfer and decision support tools and technical assistance are available to targeted clienteles, in particular for stakeholders in the health network, the municipal sector, decision-makers, the tourism industry, professional associations, institutions, businesses, community organizations, and communities in northern and southern Québec.

A government website devoted to climate change will also be created to facilitate the dissemination of knowledge, know-how and the climate change tools available, including specialized information from government departments in all sectors of activity. It will enable individuals, businesses, municipal bodies and all of the other stakeholders concerned to easily pinpoint the support programs under the CCAP 2020 for which they may be eligible. An information service for individuals who wish to act in respect of climate change will also be made available. Applications for smartphones may also emerge to better equip Quebecers in making everyday choices.

Priority 8: Mobilize Québec by supporting initiatives in civil society and in communities

The CCAP 2020 will continue to support community initiatives and citizen involvement in GHG emission reduction and adaptation to climate change.

The support accorded to civil society will be enhanced and will focus both on GHG reduction and adaptation to climate change. From the perspective of moving from the consciousness-raising to the mobilization stage, particular attention will be paid to major catalyst projects with well-defined spinoff. Local and one-off initiatives will also be included. The target clientele will be broadened to include both non-profit organizations, cooperatives and communities, as well as the Aboriginal communities, for which adaptation to climate change is already a tangible reality. Lastly, the implementation of an educational section will encourage educational institutions to create awareness-raising and mobilization initiatives aimed at students.

Young people must immediately be associated with the fight against climate change. In the elementary and secondary education sector, the notion of climate change can be broached in certain courses in the educational program or on the initiative of trainers through transversal competences or extracurricular activities. Teachers and trainers will be encouraged to acquire and transmit notions on climate change. An assessment of needs, in particular among teachers and their associations, will be conducted to ensure that teachers have at their disposal the appropriate educational programs and tools and that young Quebecers are aware of the reality of and challenges posed by climate change when they complete their compulsory school path.

Mon climat, ma santé!

The Ministère de la Santé et des Services sociaux, in collaboration with community organizations, has launched two websites aimed at heightening awareness among its clienteles of the links between climate change and health. The first website, Mon climat, ma santé (www.monclimatmasante.qc.ca), summarizes in an accessible manner dozens of Québec and international research reports concerning the impact of climate change on health in addition to presenting illustrations and concrete examples of adaptation. The second website, Mon climat et moi, is aimed at the school population (www.monclimatetmoi.com).

Priority 9: Raise Québec's profile in Canada and on the international scene

Since the early 2000s, the Québec government has displayed leadership in the realm of climate change both in North America and abroad. The international partnerships that it has established are enabling it to take advantage of a valuable bank of the best practices adopted on all of the continents. These forums also afford Québec an opportunity to promote abroad its expertise and that Québec's private sector, thereby encouraging its partners to act. One striking example of the benefits of such partnerships is the establishment of a North American carbon market, in collaboration with California, British Columbia and Ontario. Furthermore, given that a number of regions in the world are now facing the challenges posed by adaptation to climate change, Québec's cutting-edge expertise will be put to good use and international partnerships will be encouraged.

The government will, therefore, pursue its partnerships both in Canada and on the international scene, in particular in the Network of Regional Governments for Sustainable Development (nrg4SD) and the Climate Group. It will also carry out joint projects with its regional partners in the Conference of New England Governors and Eastern Canadian Premiers and the Great Lakes—St. Lawrence River Water Resources Regional Body. It will step up its initiatives in these groups in order to call attention abroad to the crucial role that federated states and regions are playing in the fight against climate change. Accordingly, it will take advantage of all available forums at international UN conferences to promote this role and its leadership in the fight against climate change.

Within Canada, the government will encourage its federal partners to be more ambitious and step up its initiatives by bolstering collaboration in priority fields for Quebecers, such as the electrification of transportation, energy efficiency, and the broader availability of public transit.

2.4 LEAD THE WAY - QUÉBEC GOVERNMENT COMMITTED TO SET THE EXAMPLE

By adopting an ambitious GHG emission reduction target and a strategy to adapt to climate change, the Québec government must not only contribute to the attainment of climate change objectives but also do so in an exemplary manner.

Several policies, directives and strategies are already geared to this end. Mention should be made of the *2006-2012 Climate Change Action Plan,* the *Government Sustainable Development Strategy 2008-2013,* the *Act to affirm the collective nature of water resources and provide for increased water resource protection,* the *Dam Safety Act,* and the *Québec Strategy for Drinking Water Conservation*.

The Québec government intends to pursue this course by ensuring the coherence and complementarity of government policies overall and management tools with the GHG emission reduction and adaptation objectives that Québec has adopted. It also intends to do its share to substantially reduce emissions from its operations.

Québec's vision for government exemplarity in the context of climate change

By 2020 and beyond, climate change tools will be increasingly integrated into legislative and regulatory tools and the government's planning and decision support tools throughout the public administration. The Québec government will have inspired businesses, communities and individuals in the realm of climate change through innovative measures covering its own operations.

Priority 10: Integrate the concern for climate change into the public administration

In a coherent sustainable development perspective, it is essential to integrate a concern for climate change into the public administration to ensure that government intervention is coherent with the objectives that Québec has adopted in this regard.

To this end, the key government measures (legislative, regulatory, administrative and financial support tools) will be examined, in order to identify the most relevant revisions, adaptations and updates that the government departments and bodies responsible can make. The government will also introduce the concern for climate change, if it is relevant to do so, when new legislative instruments and government policies are elaborated.

Planning and decision support tools must also be adapted to the context of climate change. More specifically, the government plans to reinforce the recognition of climate change when environmental analyses of projects are conducted. It intends to update environmental control processes according to climate change-related risks.

From the standpoint of the acquisition and management of infrastructure and equipment, the duration of the period of return on investments will be reviewed to encourage recourse to renewable energies and green technologies. The operating costs of buildings and rolling stock (maintenance, consumption and other costs) will be taken into account at the time of construction or acquisition, which will foster, in particular, fuel-efficient buildings and vehicles.

Priority 11: Foster a reduction of GHG generated by the operations of the public administration

Emissions from the Québec government (the public and parapublic sectors) account for 1% of Québec's overall GHG emissions (approximately 1MT of CO_2 equivalent), of which 87% comes from buildings and 13% from the government's vehicle fleet. While this represents only a small proportion of emissions, the government has a duty to display exemplarity. It will, therefore, exercise its leadership by substantially reducing its own emissions.

This maximum reduction approach has been adopted rather than the emission offset approach such that all government funds are used to enhance the energy performance of its buildings and vehicle fleet, making them, by the same token, less vulnerable to higher energy prices. Taxpayers will benefit through lower costs stemming from efficiency gains. However, Québec will continue to monitor the development of and changes in the instruments used to offset emissions and achieve a net zero carbon footprint, and will evaluate, if need be, the relevance of a carbon fund.

The main government departments and bodies will be asked to produce an annual GHG emission balance sheet pertaining to the management of their buildings and travel by their employees (vehicle fleets and business travel) in order to better pinpoint and monitor changes in their GHG emissions. The departments and bodies will periodically report the measures implemented to reduce such emissions. This requirement will be introduced gradually in the government departments covered, then in government bodies by 2020.

Government buildings

The construction of new buildings in the public and parapublic sectors and the expansion of or major renovations in existing buildings will be subject to new government standards. Starting in 2016, new buildings must use renewable energies to operate their heating systems, in particular geothermal, solar or wind power, or hydroelectricity. Moreover, their energy performance must surpass by 20% the requirements of the *National Energy Code of Canada for Buildings 2011* (NECB).

As for existing buildings, the government is seeking to replace by 2020 heating systems that use heavy or light fuel oil as the main source of energy with systems that rely on the forms of energy mentioned earlier. The annual $20-million budget allowance from which the health and education networks will benefit until 2016 will, in particular, be used for this purpose. This allowance may be renewed beyond 2016 depending on the funds available.

Moreover, to foster the use of materials with a low carbon footprint, the possibility of using wood as a structural and appearance material must be evaluated at the conception phase of new public buildings. This solution should be emphasized when the conditions are appropriate. Moreover, this approach might apply when grants are awarded for the construction or expansion of cultural, community, sports and tourist buildings.

Lastly, the government will revise the norms governing the location of its public buildings such as schools, local community service centres and government buildings, in particular to promote access by public transit, strengthen the existing urban fabric, and reduce travel. Account will also be taken of this concern when government grants are awarded to municipal and private infrastructure projects.

Overall, these initiatives should enable the public administration to reduce by 2020 emissions from its buildings 15% below the 2009-2010 level, in addition to those already achieved since 2002 (16%).

Travel by public servants

In the realm of travel by public servants, the government will adopt the means necessary to reduce the carbon consumption of its vehicle fleet and contribute to the *Electric Vehicles 2011–2020 Action Plan*. The emission reduction objective for the institutional light-duty vehicle fleet is 9% on average and the principal owners of light-duty vehicle fleets will be attributed a specific reduction objective to ensure the attainment of this government target in 2020. The 9% reduction objective has been set bearing in mind the increase in activities and the renewal of the light-duty vehicle fleet.

The government will also pursue the implementation of its sustainable commuting program in government departments and bodies to encourage public servants to relinquish solo car use and opt for public or alternative transport. It will also evaluate the timeliness of limiting the number of parking spaces in new buildings in order to encourage its employees to rely on alternative transportation.

Québec's carbon footprint

The Québec government has launched a pilot project aimed at preparing the province-wide establishment of a recognized carbon footprint certification system that enables Québec businesses to display the GHG emissions emitted by their products and services throughout their life cycle. The choice of certification system is of the utmost importance to ensure the credibility of certification and recognition of it outside Québec with a view to exporting our products on external markets. Displaying the carbon footprint of products is a useful instrument in the fight against climate change. It informs individuals of the impact of their consumption choices on GHG emissions and steers them to greener choices (www.empreintecarbonequebec.org).

Government purchasing

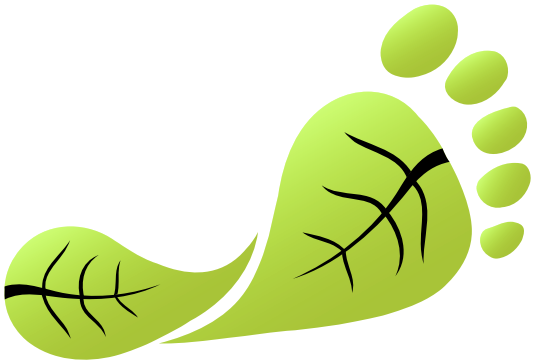
Lastly, the government will integrate the concern for its carbon footprint into public procurement in a spirit of respect for the agreements on the opening of public procurement that it has concluded. It will initially indicate those goods and services in respect of which requirements will be imposed in priority in respect of the carbon dioxide and environmental footprint, in particular according to the volumes purchased and the size of the carbon footprint in terms of GHG. Then, when the Québec government has determined the standards for life-cycle analysis, requirements for this purpose might be included in government invitations to tender for such products and services. By stimulating demand for low-carbon-footprint products, the government is supporting firms that wish to reduce their environmental impact.

3 REDUCE OUR GREENHOUSE GAS EMISSIONS IN ALL SECTORS

Transportation, industry and buildings are the main sectors targeted by GHG reduction efforts since they account for over 85% of the emissions in Québec's GHG inventory. The sectors also have the most significant emission reduction potentials. An effort will also be made to reduce emissions in sectors that account for a smaller portion of our inventory, i.e. agriculture, residual materials and electricity.

To reduce its carbon dioxide footprint, Québec will rely on measures that reduce GHG emissions as well as on measures that focus on avoiding anticipated emissions. Some development choices such as the Plan Nord can indeed affect anticipated emissions, just as elaborating projects optimally at the early stage of their conception can.

Technical interventions such as energy efficiency, energies that generate less GHG and optimization of processes will mark a significant step toward the reduction target. Other measures will be added and will target behaviour changes in order to advance further in the attainment of the 2020 objective.



Moreover, most of the initiatives will aim energy related emissions reductions, which, generally speaking, are easier to reduce, offer a return on investment and reduce operating costs. Indeed, to effectively fight climate change, we must reduce our dependence on energies that emit substantial GHG emissions. To this end, we can reduce our energy needs at the source through well-designed land-use planning and projects, rely on a more efficient use of the entire array of energy forms, and foster the use of energies that generate fewer GHG. This approach, several components of which are already found in the *Québec Energy Strategy 2006-2015*, will be used in all the sectors that emit GHG in Québec. The attendant initiatives will be presented in the sections devoted to each sector.

Fossil energy now accounts for roughly half of the energy consumed in Québec. Hydroelectricity, and to a lesser extent, biomass, account for the other half. While the replacement of fossil energy by less-polluting energy sources is necessary in a climate change perspective, this strategy has its limits, including the availability of alternative energies, the difficulty of replacing fossil energy for certain uses, and the relative cost of different forms of energy. Moreover, the environmental and social impacts linked to the production and use of all forms of energy must be considered.

While the current limits to the substitution of fossil fuels to energy that generate less GHG may be driven further through technological advances or sweeping societal changes, fossil energy will continue to be present in Québec's energy profile for the foreseeable future. For this reason, the CCAP 2020 relies not only on renewable energies but also on the energy efficiency of all forms of energy and the optimization of projects to reduce energy needs at the source. Furthermore, when reliance on renewable energies cannot be contemplated, the CCAP 2020 will favour, among the different kinds of fossil energy, those that emit the least GHG.

In the fields of energy efficiency and energy innovation, it should be noted that the *2007-2010 Energy Efficiency and New Technology Master Plan* led to the implementation of certain policy directions in the Québec Energy Strategy 2006-2015. The next master plan will stipulate policy directions and priorities respecting energy efficiency and innovation and ensure coherent, effective action with regard to all forms of energy. Energy efficiency and innovation are at the heart of the CCAP 2020 and the government will ensure the coherence and the complementarity of these two approaches to foster the attainment of GHG emission reduction objectives.

Moreover, other types of initiatives are under study at the international level to evaluate their potential to contribute to the fight against climate change, including those centred on GHG capture (at the chimney), geological, mineralogical, biological and other forms of sequestration, or those that affect the albedo of the planet. Bearing in mind that such initiatives are still being studied, experimental or at best, rollout stage, some of them might be subject to analysis or pilot projects in an experimental framework in order to better evaluate their potential contribution to the attainment of Québec's target for 2020 and beyond. This will be true, in particular, for short-lived climate forcers whose emission reduction could contribute significantly to the global warming problem in the medium term.

What is a short-lived climate forcer?

The CCAP 2020 makes provision to examine sources of gas and particulate emissions that are deemed to have a significant impact on short-term global warming but about which little is known. Known as short-lived climate forcers (SLCFs), these airborne pollutants are apparently very harmful to agricultural yields, ecosystems and human health. The pollutants include carbon black, e.g. soot emitted into the atmosphere by forest fires or the incomplete combustion of fossil fuels, biofuel and biomass. The Arctic regions are the most affected by carbon black since it accelerates the melting of ice and glaciers. The United Nations Environment Program confirms that substantially reducing SLCFs would limit global warming to half a degree Celsius by 2050.

3.1 ESTABLISH A CARBON MARKET

Beyond the measures in each of the sectors of activity, the government is relying on an economic instrument that will play a dominant role in Québec to encourage GHG emission reduction in several sectors, i.e. the GHG emission cap-and-trade system.

Priority 12: Send a carbon price signal by establishing a GHG emission cap-and-trade system

According to an OECD study, one of the most effective strategies in the fight against climate change is to set a price for GHG emissions. Unlike conventional regulation under which businesses may not exceed an emission standard (strict limit on the emission of pollutants), a system based on the economy offer to businesses some degree of flexibility since it allows them to decide how they will comply with their short, medium and long-term obligations.

It is in this context that the Québec government has established an ambitious GHG emission cap-and-trade system within the framework of the Western Climate Initiative (WCI), an organization of federated North American states that are seeking to develop a common approach to fight climate change.

Starting January 1, 2013, large emitters in the industrial and electricity sectors, whose annual GHG emissions total 25 000 tons of CO_2 equivalent or more, will be the first to be subject to the system. In January 2015, enterprises that distribute or import fossil fuels in Québec will also have to comply to the system. The price signal sent by the GHG emission cap-and-trade system will also indirectly encourage users to reduce their consumption of fossil fuels.

Within the framework of the cap-and-trade system, businesses are under the obligation to remit to the government the emission allowances for each ton of GHG emitted, bearing in mind that the allowances available on the market are reduced from year to year. If a company does not have a sufficient number of emission allowances to cover its emissions (the government allocates or sells the allowances) then it must purchase them on the carbon market. To avoid or reduce costs associated with the purchase of emission allowances, the company may then decide to reduce its GHG emissions, which is the objective. Indeed, for businesses GHG reduction often means gains in efficiency, profitability and competitiveness. For Québec society overall, this means a more robust economy and reduced dependence on fossil energy.

For this reason, the CCAP 2020 is proposing to businesses incentives and support programs designed to enhance the benefits and advantages stemming from investment decisions in Québec to reduce their GHG emissions.

Québec's transportation vision in the context of climate change

By 2020 and beyond, Quebecers will be relying increasingly on the public transit and alternative transportation available to them rather than solo car use because such transportation will be readily accessible and efficient and because of the numerous financial, social and environmental benefits they will derive from it. Freight transportation will rely more extensively on railways and navigable waterways. Investments in energy efficiency and clean energies, intermodality and logistics will generate significant efficiency gains in all modes of transportation.

3.2 FOSTER THE SUSTAINABLE MOBILITY OF INDIVIDUALS AND GOODS

Transportation is the leading sector from the standpoint of GHG emissions in Québec (43.5% of the inventory in 2009) and it must contribute significantly to GHG emission reduction for 2020. That is why the government is earmarking such a substantial portion of carbon market revenue for the sector. Indeed, two-thirds of the revenues from the market and the extension of the levy on fuels will fund initiatives that will reduce GHG emissions in the transportation sector.

Emissions in the transportation sector have risen by nearly 30% since 1990. Road transportation alone accounts for over three-quarters of the sector's emissions, which have increased substantially since 1990. This situation is attributable, in particular, to greater numbers of trucks and cars on Québec roads that are travelling greater distances each year. The growing popularity among consumers for sport utility vehicles in recent years has also increased road transport emissions, a trend that has not been reversed by the introduction of less energy-consuming models. As for the rail, maritime and air transportation sectors, they are contributing much less significantly to emissions in the transportation sector, i.e. 2.2%, 3.7% and 2.1%, respectively. Lastly, the off-road vehicle and pipeline transportation sectors account for nearly 7% of emissions.

The CCAP 2006-2012 already focused extensively on the transportation sector, in particular by supporting public and alternative transportation, intermodality and energy efficiency. Furthermore, the government has made compulsory the installation of speed control devices set at 105 km/h on trucks, adopted a GHG emission standard for light vehicles, an emission opacity standard for heavy vehicles, and tax incentives for the purchase of hybrid or electric vehicles.

Transportation will once again be at the forefront of Québec's GHG reduction efforts for 2020. We will continue to rely on support for public transit and alternative transportation, technological efficiency and innovation in all modes of transportation, and make broader use of less-polluting forms of energy. This type of initiative will enable us to significantly reduce the sector's emissions.

However, we must superimpose on such solutions a sweeping review of our modes of transporting passengers and freight so that Québec is able to reduce its GHG emissions to the desired level in 2020. Indeed, despite the technological improvements and efficiency gains achieved in all modes of transportation since 1990, the sector's emissions have risen markedly since then. Possible solutions depend, in particular, on structuring initiatives in land-use planning, better harmonization of investments in each mode of transportation in light of GHG emission reduction objectives but also on a review of governance methods for certain aspects of the sector.

Priority 13: Promote public transit and alternative transportation by enhancing their availability, developing infrastructure and facilitating sustainable choices

The shift being sought from solo car use to public transit and alternative transportation implies that sufficient infrastructure and services are available to facilitate travel and adequately satisfy Quebecers' needs.

Significant progress has been made since 2006 with the implementation of the *Québec Public Transit Policy*. The services offer increased by 21% and ridership increased by 11% between 2006 and 2011. The Québec government wishes to go even further in offering concrete alternative solutions to solo car use.

Accordingly, within the framework of the CCAP 2020, substantial investments will be made in public transit, in particular to consolidate the services in cities, between regions and in rural areas, and to enhance the efficiency of rolling stock, e.g. the acquisition of hybrid and electric buses. Moreover, through the CCAP 2020, the government will actively promote the development and use of alternative modes of transportation to solo car use, including carpooling, car-sharing, taxi-sharing and active transportation, such as walking and cycling. It will support, in particular, initiatives that facilitate carpooling to travel to work and the construction of new utilitarian bicycle lanes.

In all likelihood, a simple increase in the availability of public transit and alternative transportation will not succeed in increasing the number of passengers sufficiently to reverse general trends. Other initiatives will be necessary, bearing in mind regional and local characteristics. Demand management is an avenue for action whose efficacy has been confirmed in numerous countries. It implies an array of measures that influence, in particular, the needs, the time of day at which travel occurs or the individual choices of transportation modes. It seeks to foster carpooling, cycling and the management of parking to complete the efforts to develop public transit. Demand management also has the advantage of maximizing the use of existing transportation networks and, consequently, the profitability of the substantial investments made in public transit and alternative transportation both from an economic standpoint and in terms of GHG reduction. Close linking between land-use planning and the development of transportation networks will also contribute to such management.

Investments in public transit and alternative transportation engender numerous benefits for individuals and communities. An accessible, efficient public transit system and fully developed alternative transportation system infrastructure are key economic and social development tools for Québec and its municipalities. They enhance individual mobility and alleviate congestion, which leads to smoother passenger and freight transportation flows. In addition, each modal shift from automobile travel to public transit and alternative transportation contributes to reducing pollutants and GHG emissions and improves the physical condition of users.

Other measures might be contemplated to promote a reduction in the number of kilometres that motorists travel. For example, within the context of pilot projects set up in Oregon, Minnesota, Switzerland and the Netherlands, a device installed in cars counts the kilometres travelled and links a pricing rate to the distance. The installation of intelligent parking metres, as is the case in San Francisco, might also be a means of avoiding needless travel and ascertaining in real time the parking spaces available.

Québec's sustainable mobility policy will come into force in 2013. The new policy will seek to consolidate and develop the services for public transit by 2020. It will propose a new financial framework that allows for the development of public transit services, active transportation, carpooling and car-sharing, and the implementation of demand management strategies. The policy will bring to life the government's perspective of public transit and alternative transportation and contribute to Québec's GHG objectives and the enhancement of Quebecers' quality of life. Details of the policy will be unveiled later.

Priority 14: Create a greener car fleet through more fuel-efficient and better maintained vehicles

While public transit and alternative transportation are the ideal choice when available, reliance on the automobile will still be necessary for many everyday trips. In this context, the government will also intervene to reduce emissions from the car fleet by implementing several initiatives centred on demand for fuel-efficient vehicles and the enhancement of the energy and environmental performance of vehicles.

Through its *Electric Vehicles 2011–2020 Action Plan*, the Québec government wishes to ensure that 25% of new light-duty passenger vehicles sold in 2020 are electric (rechargeable hybrid or entirely electric). Reliance on green energy instead of conventional fossil fuels significantly reduces GHG emissions stemming from individual travel. The discount on the purchase or leasing of electric vehicles and the installation of charging stations, in effect until 2015, is accelerating the arrival in Québec of electric vehicles by offering financial support to Quebecers who wish to reduce the environmental impact of their travel. The plan could be broadened and include motorcycles in the coming years.

A feebate system applicable to the purchase or registration of a new vehicle will be examined as a prime tool to further support the shift to the electrification of transportation, bolster incentives to make ecoenergetic choices and simultaneously reduce Québec consumers' vulnerability to rising gas prices. Clear, compulsory displays will inform consumers of the impact of their choice of vehicle on the cost of fuel and energy that they will incur and the attendant GHG emissions. The coming into force of the new incentives would be planned beyond 2015, in particular to ensure linking with the introduction of more rigorous emission standards.

Having contributed significantly to the adoption of a more stringent GHG vehicle emission standards in North America for the period 2010-2016, the Québec government, in collaboration with its North American partners, intends to continue to rely on the intervention levers available to it to ensure that the standards are reinforced starting in 2017.

Aside from the standards and the choices of vehicle and fuel, behaviour can make a significant difference in regards to energy consumption of vehicles and their GHG emissions. With this in mind, the government will implement a light-duty vehicle inspection and maintenance program (PIEVA). An environmental compliance inspection will be required for vehicles over eight years old when they change owner. The program could then be broadened by 2020. It will not only focus simultaneously on health problems stemming from airborne pollutants by reducing pollutant emissions but also avoid costs related to overconsumption of fuel by motorists. Fuel-efficient driving and the avoidance of idling, which were subject to targeted initiatives in the CCAP 2006-2012, will continue to be promoted as additional means available to motorists who wish to drive in a greener manner and at less cost.

Lastly, within the framework of its participation in the Conference of New England Governors and Eastern Canadian Premiers, Québec is monitoring the development of knowledge on standards concerning low-carbon fuels. This type of measure could be contemplated when the conclusions of deliberations reveal that this option would be beneficial for Québec.

Priority 15: Invest in intermodality and logistics to optimize freight and passenger transportation

Reliance on railroads and navigable waterways where available in Québec makes it possible to use less energy to transport freight compared to road transport but also to reduce the use of automobile for passenger transport. Moreover, the *Québec Energy Strategy 2006-2015* proposes initiatives to promote the use of railroads and waterways.

In this context and in the wake of the CCAP 2006-2012, the government will, therefore, continue to invest in the development and enhancement of infrastructure and intermodal centres to increase the share of less energy-consuming modes of transportation and to optimize travel by combining different modes of transportation depending on the route traveled. The investments will develop rail and maritime transport, make them more efficient and attractive, and make known their benefits to broaden reliance on them and build customer loyalty. The requisite conditions to sustainably increase the railroads' and navigable waterways' share of modal transportation in the freight transportation sector will be introduced gradually.

Logistics is also a promising avenue both to optimize unimodal transportation and to facilitate intermodality. Projects to enhance logistical practices will, therefore, be implemented to create intermodal transportation hubs. To this end, the best practices in logistics, assisted by the information and communications technologies (ICTs), can contribute to more widespread use of less energy-consuming modes of transportation by allowing better management of infrastructure, traffic and fleets, facilitating goods tracking, and improving the exchange of information between stakeholders in the transportation logistics chain.

Priority 16: Enhance the efficiency of maritime, rail, air and off-road transportation

In view of the government's determination to promote broader reliance on rail and maritime transport, it is important to focus on the efficiency of these modes of transportation and implement initiatives aimed at reducing their GHG emissions.

In this context, investments will enhance the efficiency of rail and maritime transport, through energy efficiency measures or the enhancement of processes, conversion to less-polluting energy sources, or the modernization of equipment.

While the modal share of rail and maritime transport is still limited in freight transportation, the efficiency gains achieved are significant and sustainable considering the lengthy useful life of rail and maritime infrastructure.

Efficiency gains are also possible in the air and airport equipment sectors. The worldwide airline industry's willingness to reduce its carbon footprint might pave the way to new possibilities for GHG reduction in the sector in the coming years. The use of less-polluting sources of energy in airport equipment such as baggage trucks, delivery trucks, passenger shuttles, and so on, also warrants consideration.

Several governments and associations in the maritime, rail and air sectors are examining the possibility of introducing standards and requirements or elaborating best practice codes to reduce the GHG emissions of these modes of transportation. Québec will promote such efforts, which can contribute to a reduction in the emissions of Québec carriers in its territory and beyond its borders.

Lastly, the possibility of reducing emissions in the off-road vehicle and equipment sector will also be examined. Measures that achieve energy efficiency gains might be contemplated for off-road vehicles used for recreational or transportation purposes (ATVs, snowmobiles, and so on) and for off-road equipment used in several sectors of activity such as mining, forestry or agriculture.

Priority 17: Reduce the environmental footprint of road freight transport

The trucking and delivery sector must contribute significantly to GHG reductions with a view to attaining the 2020 target. The government will contemplate all possible avenues to increase the efficiency of this mode of transportation and reduce its emissions.

An approach will be established to support fleet managers, in particular, to conduct energy audits, determine the efficiency measures to be introduced and elaborate tools to pinpoint the best maintenance practices or the most fuel-efficient choices when vehicles are replaced.

The government will also continue to financially support fleet owners who wish to invest to enhance the energy efficiency of their vehicles and thus reduce their operating costs, e.g. the installation of equipment to enhance vehicle aerodynamics, the conversion of trucks to electric hybrid vehicles, or conversion to less-polluting energy such as natural gas or biogas. The possibility of defining the use of certain technologies through regulations will be examined.

As is true of automobiles, fuel-efficient driving techniques will be especially appropriate to reduce fuel consumption. Fleet owners who wish to train their employees may thus benefit from financial support in this respect.

Aside from the gains in energy efficiency, energy conservation and GHG reduction, all of these initiatives will also contribute to facilitating compliance by manufacturers with impending North American standards governing the GHG emissions of new heavy-duty vehicles. Québec will support the adoption of more stringent emission standards in this sector.

3.3 SUPPORT QUÉBEC FIRMS IN THE TRANSITION TO A LOW-CARBON ECONOMY

The Québec industrial sector ranks second after the transportation sector in terms of GHG emissions by sector, with 28% of the inventory (22.9 megatons of CO_2 equivalent in 2009). Aside from fugitive emissions or emissions from solvents, emissions in this sector are attributable to industrial combustion (55.5%) and manufacturing processes (43.5%). Since 1990, they have declined by roughly 25%, in particular as a result of enhanced energy efficiency and technological choices, substitution of fuels, but also because of the shift in Québec from manufacturing to a service-centred economy.

Québec has several thousand industrial establishments. However, most of the emissions (88%) come from major industrial emitters (25 kilotons of CO_2 or more annually), i.e. fewer than 100 businesses.

The cost of energy and raw materials account for a significant portion of the expenses of a number of businesses. Such firms must, therefore, regularly optimize their manufacturing processes or production methods, or adopt energy efficiency measures. To invest in energy efficiency is to reduce costs, improve the profitability of businesses and their competitiveness. It also reduces their vulnerability to the availability of fossil energy and increases in the price of such fuels. At a time when the world's oil reserves are dwindling because of growing demand and climatic considerations could restrict or increase the cost of using fossil energy, efficiency and austerity in carbon consumption are required.

Québec's vision for industry in the context of climate change

By 2020 and beyond, Québec industry will have developed while innovating to reduce its greenhouse gas emissions. The optimum conception of projects in order to limit new GHG emissions will be one of the usual good practices of promoters and a factor that the public administration will recognize when authorizing the projects and granting financial support. Businesses, especially in remote areas, will have better access to remote renewable, less-polluting energies and rely on them more extensively.

It goes without saying that businesses that act promptly and modernize will be at the greatest advantage. Since the reduction of GHG emissions is often synonymous with being more efficient, especially from the standpoint of energy, GHG emission reduction combines both the organizational objective of profitability and the environmental objective of GHG emission reduction. By supporting the transition of its economy, the Québec government is displaying vision.

In order to support efforts by Québec firms to reduce their GHG emissions, the CCAP 2006-2012 granted financial support to businesses wishing to convert from fuel oil, butane and propane to a form of energy generating lower GHG emissions or to improve their energy efficiency. The initiatives generated sound outcomes both for the environment and the profitability and competitiveness of the participating businesses.

Priority 18: Enhance the carbon balance and energy efficiency of Québec firms

Energy conservation, reliance on renewable energies or energies that produce fewer GHG emissions, the ongoing improvement of industrial processes, and the choice of the most efficient equipment when new projects are carried out are initiatives that will be encouraged to support the sustainable development of Québec firms.

Initially, a single entry point will be established to accelerate and facilitate access by enterprises to government support. The programs under the CCAP 2020 will also be more inclusive than those established previously in order to seize a greater number of opportunities to reduce GHG emissions in the industrial sector. Several sectors of activity and businesses of all sizes, from major emitters to small and medium-sized enterprises (SMEs), will be eligible for financial support in order to improve their productivity while reducing their carbon footprint.

The financial assistance granted, which could take several forms such as non-refundable contributions, loans or loan guarantees, will cover projects that significantly reduce GHG emissions. Such projects may consist in the implementation of on-site efficiency measures, the installation of energy or energy conversion equipment and initiatives aimed at instilling a culture centred on efficiency, the optimization of processes, and energy conservation in businesses. In the latter instance, energy audits or energy integration between industrial sites may be considered.

Guidance initiatives for enterprises and worker training measures pertaining to the new processes, energy management practices and GHG reduction technologies will round out the government assistance.

3.4 FOSTER THE EMERGENCE OF SUSTAINABLE BUILDINGS

The building sector accounts for 15% of Québec's GHG emissions, which are mainly attributable to heating. Consequently, they can vary markedly from one year to the next depending on the harshness of the winter. Since 1990, residential emissions have plummeted by 43% because of more widespread use of electric heating. Emissions from institutional buildings (government buildings, educational institutions, hospitals and so on) have fallen by 15% since 2002 as a result of energy efficiency and the conversion of oil-fired heating systems to renewable energies and natural gas.

Québec's vision for buildings in the context of climate change

By 2020 and beyond, Québec will be in the vanguard in the construction of green, fuel-efficient buildings thanks to reinforced standards and broader reliance on green technologies and materials. The recognition of the environment into which buildings are integrated will be more widespread in planning. GHG emissions from Québec's building inventory will decline, in particular through a reduction in the use of fuel oil to heat buildings and conversion to renewable energies.

However, the picture is not quite as bright regarding commercial buildings. The significant increase in the surface area of buildings such as megastores and more widespread use of natural gas in new buildings have significantly increased GHG emissions in the sector since 1990.

There are numerous programs in Québec that can contribute to reducing GHG emissions from buildings, focusing on energy efficiency, new technologies and emerging energy sources. To accelerate the emergence in Québec of green buildings, the initiatives that will be put forward within the framework of the CCAP 2020 will complement these programs. They will seek both to enhance standards and regulations governing buildings and to ensure financial support for the reduction of their carbon footprint. A reduction of energy needs and GHG emissions at the source must be taken into account when new buildings are planned or existing buildings are renovated. To this end, an integrated approach will be emphasized.

Priority 19: Adopt greener building standards

Add green provisions to the Québec Construction Code

Québec has a number of standards governing buildings, the cornerstone being the Québec Construction Code, which defines the minimal standards to be observed. By focusing on the Code, the government is thus adopting the means of significantly and sustainably altering the construction market.

Through the CCAP 2006-2012, the standard under the Novoclimat program will apply to all new residential construction as of July 1, 2012. For the duration of the CCAP 2020, the government intends to pursue this avenue by reviewing at least every five years the energy efficiency requirements for all types of buildings (residential, commercial and institutional). To this end, the commercial and institutional sectors will be subject to new standards starting in 2015, and those in the residential sector will be revised in 2017.

Remove obstacles to the use of renewable energies and green technologies

The emergence of green buildings in Québec depends, in particular, on broader reliance on renewable energies such as solar and geothermal energy, hydroelectricity and wind power. There are several regulatory and normative barriers that hamper their use, e.g. restrictions on the installation of solar panels or wind turbines in urban environments. The government will thoroughly examine the barriers and eliminate those that are no longer warranted.

Elaborate a Québec sustainable building strategy

Aside from the issue of climate change, challenges stemming from green buildings must be approached in the broader context of sustainable development. For this reason, the government will elaborate a Québec sustainable building strategy that will focus, in particular, on the environmental impact of buildings from the design stage to their demolition, their impact on Quebecers' health and well-being, and the economic benefits that optimal building design engenders. Among the factors to be covered, mention should be made, in particular, of integrated building design, energy and water needs, the integration of buildings into their environment and the urban fabric, the introduction of new technologies, GHG emissions, adaptation to climate change, and health, both for existing and future buildings. The purpose of the strategy will be to implement measures to make Québec buildings greener but also to mobilize and pool the efforts of all stakeholders.

The carbon footprint of buildings can be reduced by promoting the use of materials that generate fewer GHG emissions over their useful life (from extraction to elimination) or that have sound insulating properties in order to reduce the building's energy consumption over its useful life. In this context, wood is an attractive choice since it generates few GHG emissions compared with other commonly used construction materials. Accordingly, in conjunction with the *Wood Use Strategy for Construction in Québec*, the government will encourage the use of wood in the non-residential construction sector, where its use is much less widespread than in the residential sector. To this end, the Régie du bâtiment du Québec will take steps to facilitate the use of wood in buildings over four storeys in Québec. Several initiatives will be supported to better publicize the relative advantages of wood and other materials with a low carbon footprint and further develop practices, in particular the realization of life cycle analyses adapted to the Québec context and the elaboration and organization of advanced training for professionals in the construction sector. Lastly, the realization of catalyst projects that call for the construction of environmentally responsible wood buildings will demonstrate the possibility of using this material in order to make them reference models.

Moreover, the government will examine the scope of certain environmental certification specific to buildings in the Québec context, e.g. LEED certification and BOMA, and regulatory measures in force abroad that might prove worthwhile in Québec. In particular, the government will examine the potential impact of compulsory energy ratings for residential, commercial and institutional buildings. Depending on the impact revealed, such an initiative might be implemented during the second phase of the CCAP 2020.

Priority 20: Promote renewable energies and **energy efficiency in residential, commercial and institutional** buildings

The residential sector

The Québec residential sector contributes to a lesser extent to Québec's GHG emissions since 79% of households heat with electricity. However, a number of households use light fuel oil to heat their homes. In this context, the government will financially support Quebecers who wish to convert their fossil fuel heating systems to systems that rely on geothermal, hydroelectric, wind or solar power. Assistance for conversion will complement that offered under the Rénoclimat program. This integrated approach will reduce energy needs and promote renewable energies.

Furthermore, the government will fund part of the cost of acquiring equipment for supplying electricity from renewable energies for buildings not connected to Hydro-Québec's grid, which are mainly located in northern Québec and remote areas.

The commercial and institutional sectors

The government will enhance current energy efficiency subsidies in commercial buildings and will also support recourse to geothermal, hydroelectric, wind or solar power in new buildings and the conversion of fossil fuel heating systems to these forms of energy. In addition, the concomitant establishment of energy

efficiency measures will be encouraged to reduce energy needs at the source and take advantage of all possibilities for enhancing the energy efficiency of the buildings targeted. Lastly, special attention will be paid to initiatives carried out in buildings located in northern Québec and supplied by autonomous electrical grids.

The government will rely on the necessary intervention mechanisms to eliminate by 2018 the use of No. 5 and No. 6 heavy fuel oil to heat commercial and institutional buildings. This initiative will allow for significant gains with regard to energy efficiency, air quality and the reduction of environmental hazards linked to the storage of heavy fuel oil.

Priority 21: Reduce the use of halocarbons

Halocarbons are GHG with much greater potential for global warming than that of carbon dioxide (CO_2). The GHG reductions that can be achieved by limiting the use of or leaking of such gases are especially noteworthy in the context of the fight against climate change.

The government will pursue its Refrigeration Optimization Program (OPTER), which seeks to reduce hydrofluorocarbon (HFC) emissions in the refrigeration systems of supermarkets and arenas. Recourse to systems that use little or no HFC will be strongly encouraged and the possibility of extending the approach under the program to other sectors of application will be examined. Furthermore, the *Regulation respecting halocarbons* will be revised to broaden its scope and very strictly limit the use of hydrochlorofluorocarbon (HCFC) and HFC in refrigeration, freezer and air conditioning equipment in the commercial sector and arenas. The new regulatory requirements might apply to all new systems starting in 2014 and all existing systems starting in 2020.

3.5 CONTRIBUTE TO THE DEVELOPMENT OF SUSTAINABLE AGRICULTURE

GHG emissions in agriculture stem primarily from livestock production (enteric fermentation and manure management) and soil management. Such emissions have been relatively stable since 1990. They stood at 6.5 megatons of CO_2 equivalent in 2009, i.e. nearly 8% of emissions in the Québec inventory.

It is possible to reduce the emissions by improving certain agricultural and livestock production practices and by reducing the use of fossil fuels, in particular for machinery and greenhouse heating. Under the CCAP 2006-2012, financial support for farming enterprises and agri-food businesses was made available to fund such initiatives.

Québec's vision for agriculture in the context of climate change

By 2020 and beyond, the agricultural sector will have modified a number of its crop and livestock production practices in order to reduce their impact on Québec's GHG emissions. Through the acquisition of greenhouse heating systems and less energy-consuming equipment or equipment that operates with local, renewable energies, numerous farm producers will be less vulnerable to fluctuating oil prices.

Priority 22: Equip farmers to better manage GHG emissions from crop and livestock production

Agriculture is contributing significantly to Quebecers' food security and Québec's economic development. The CCAP 2020 therefore wishes to reinforce the sector's position by enhancing the standards governing certain agricultural practices.

Accordingly, the CCAP 2020 will focus on crop, livestock and soil management, in particular the integrated management of mineral nitrogen fertilizers, to avoid over-application, the attendant GHG emissions, and the contamination of groundwater and surface water.

Moreover, projects pertaining to manure management may be supported by the CCAP 2020. Indeed, technologies such as the capture of biogas produced by manure storage structures can contribute to reducing GHG emissions stemming from the decomposition of manure. The CCAP 2020 will also emphasize the dissemination of information, training, awareness-raising and guidance for producers and advisors on technology and agricultural practices aimed at GHG reduction. Other initiatives might also be supported according to the advancement of knowledge of GHG reduction in the agriculture sector.

3.6 LINK THE ENVIRONMENT AND THE ECONOMY IN THE MANAGEMENT OF RESIDUAL MATERIALS

In Québec, GHG emissions attributable to the elimination of residual materials account for 6.1% of Québec's total emissions (5.03 megatons of CO_2 equivalent). Such emissions stem primarily from biogas generated by the decomposition of organic residues in landfills. Between 1990 and 2009, the residual materials sector reduced its GHG emissions by 33.5% as a result of the obligation to capture and convert or eliminate biogas in Québec's main landfill sites.

While GHG emissions in this sector are attributed to landfills and incineration, it is also possible to act upstream at different stages in the product life cycle to achieve gains in the reduction or avoidance of GHG, for example through the reduction at the source and eco-design.

The CCAP 2006-2012 facilitated several advances aimed at GHG reduction in the sector through the application of the *Regulation respecting the landfilling and incineration of residual materials* and through biogas capture and support for the processing of organic matter by means of biomethanization and composting. Since 2011, the *Québec Residual Materials Management Policy* and the attendant action plan have, above all, guided government action in this field since it seeks to prohibit landfilling and promote recycling (spreading, composting or biomethanization) of putrescible organic matter for 2020.

Québec's vision for the management of residual material in a climate change context

By 2020 and beyond, the amount of residual materials per capita generated will have declined. The collection of organic matter to convert it through composting or otherwise will have been added to the collection of other recyclable materials and will be part of the usual services offered. GHG emissions from landfills will decline significantly since they will be captured at most sites and organic matter will no longer be landfilled but converted.

The contribution made by the Société québécoise de récupération et de recyclage (RECYCQUÉBEC) in the management of deposit and separate collection systems is recognized. This government corporation, which is introducing initiatives according to the 3R-R hierarchy (reduce at source, reuse, recycle, reclaim), will complement this action plan. To this effect, the future RECYCQUÉBEC strategic plan will support initiatives aimed at the management of residual material by including, in particular, solutions to prohibit organic matter from landfill sites.

Priority 23: Support GHG emission reduction linked to the management of residual material

The CCAP 2020 is intended to complement the *Québec Residual Materials Management Policy*. To this end, it will ensure follow-up to the substantial investments granted to several Québec municipalities to install biomethanization equipment to treat municipal organic residues and will account for the attendant emission reductions for 2020. Once the results of the initial biomethanization projects are known, funding and the scope of support for this type of activity will be reassessed.

The CCAP 2020 will also support the recycling of fertilizing residual materials (FRMs), including municipal biosolids, in order to reduce emissions stemming from their incineration or landfilling. FRMs are residual materials that are used to maintain or enhance plant nutrition and the physical and chemical properties and biological activity of soils.

Moreover, the CCAP 2020 will also support efforts to make the manufacturers of products whose life cycle implies GHG emissions aware of their responsibilities. To this end, the *Regulation respecting the recovery and reclamation of products by enterprises* will be amended by 2014 to cover refrigeration, freezer and air-conditioning equipment. The regulation compels businesses that market certain products to recover and process them at the end of their useful life according to the principle of extended producer responsibility. The enterprises targeted must elaborate and implement recovery and conversion programs for such products that satisfy regulatory standards and attain the prescribed recovery objectives. The Regulation also seeks to foster the design of more environmentally-friendly products. The new regulatory provisions will ensure, in particular, the recovery and conversion according to good practices of the devices targeted and, if needed, the recovery and proper destruction of refrigeration gases and insulating foam found in them and whose composites are halocarbons.

Lastly, it should be noted that financial support aimed at the realization of GHG emission reduction projects by the municipalities under the Climate Municipalities program might also achieve additional gains in the residual materials sector for those that wish to act in this respect.

The support offered by the CCAP 2020 in the residual materials sector will be reviewed, in particular according to the new initiatives stemming from the future strategy to banish organic matter and the budgets available.

3.7 CAPITALIZE ON QUÉBEC'S RENEWABLE ENERGY POTENTIAL

Some 97% of Québec's electricity generation now comes from renewable sources (hydroelectricity and wind power). This enviable situation stems, by and large, from the judicious energy development choices that Québec made over 50 years ago when it engaged in the massive development of its hydroelectric power potential.

Since then, the Québec government has clearly demonstrated its intention to pursue the development of renewable energies. In this respect, the *Québec Energy Strategy 2006-2015* calls for the implementation of new hydro-development and wind power projects for the generation of electricity and support for emerging renewable energies. The government has also announced additional electricity generation projects that rely on renewable energies within the framework of the Plan Nord.

Emissions from electricity generation account for only 0.8% of Québec's GHG emissions inventory (2009). The emissions come mainly from Hydro-Québec's thermal power plants, which are operated above all during very cold periods in the winter (La Citière, Cadillac, Bécancour), and 24 diesel-fired power plants, which supply networks (off-the-grid power systems such as the Îles-de-la-Madeleine and the northern communities) that are not connected to Hydro-Québec's central electrical distribution network.

Québec's energy vision in the context of climate change

By 2020 and beyond, renewable energies will account for a growing share of our energy consumption. Significant efficiency gains will already have been achieved in all sectors of activity for the benefit of Québec businesses and Quebecers.

Several ongoing initiatives should contribute to a reduction in emissions in this sector. Indeed, in 2012, Hydro-Québec permanently closed the Sorel-Tracy thermal power plant. Furthermore, the government corporation is elaborating combined wind/diesel pilot projects in two autonomous networks in Nunavut and the Îles-de-la-Madeleine. It is also evaluating the possibility of using underwater turbines to satisfy local electricity needs in off-the-grid power systems and even to extend its power distribution lines to certain remote communities.

The CCAP 2020 is relying on initiatives that will complement those already implemented by Hydro-Québec. In addition to the priorities related to electricity described later, special attention will be paid to the development of bioenergy in order to diversify Québec's energy portfolio and boost energy production using Québec's resources.

Priority 24: Foster the emergence of bioenergy

Genuine interest in bioenergy has been apparent for several years in Québec. Through the avenues that bioenergy offers, such as biofuel and the generation of heat, it can be advantageous. As the case may be, bioenergy can contribute to the reuse of matter otherwise destined for elimination, foster the use of local inputs or reduce our fossil energy needs.

What is bioenergy?

Bioenergy is energy that can be produced from biomass, i.e. renewable organic matter. Such biomass can originate in forests or on farms or may come from urban, industrial or other residual materials. Different methods are used to convert biomass into energy, which can take several forms.

When bioenergy replaces fossil energy, it can offer potential GHG emission reductions. However, such potential depends on several factors, i.e. the type of biomass used, the conversion technology, the fuel to be replaced, and the conditions that would have prevailed in the absence of the project (also called the reference scenario).

Within the framework of the CCAP 2020, specific projects devoted to the production, supplying or use of bioenergy will be financially supported insofar as they engender short-term GHG reductions, while preserving air quality. The eligibility criteria will be specified later and will include, in particular, recognition of the carbon debt. Support will initially be confined to projects that use residual biomass. The importance of aiming at short-term GHG emission reductions is warranted, in particular, by the recommendations of the IPCC to stabilize then reduce such emissions as quickly as possible in order to limit climate change impacts. The same goes for the importance attached to airborne pollutants, for reasons of public health and coherence with government measures adopted to enhance air quality.

Furthermore, policy directions governing bioenergy will be elaborated and will allow for the adoption of a structured, coherent approach to the production and conversion of bioenergy in Québec, based on the principles of sustainable development. The policy directions will take into account the numerous challenges that bioenergy poses, in particular the capacity to support the entire development chain of bioenergy, supply guarantees, impact on businesses and jobs linked to existing uses of the raw material, the contribution to the fight against climate change, impact on food production, and impact on air quality. They will take into account the temporal dynamics and sequestration of GHG specific to this form of energy, according to a life cycle approach and evolving scientific knowledge in this field.

Priority 25: Enhance the energy efficiency of commonly used devices

Québec households and businesses use numerous devices in everyday life that contribute to their quality of life or the smooth functioning of their operations, such as household appliances, water heaters, heating, ventilation and airconditioning systems in buildings, lighting equipment, and so on.

Several legislative and regulatory tools control the energy efficiency of such devices in Canada. In Québec, the Regulation respecting the *energy efficiency of electrical or hydrocarbon-fuelled appliances* stipulates the efficiency standards governing appliances manufactured or sold in Québec. The standards have not been updated in Québec since 1995. Market conditions or the standards imposed by other governments in Canada have rendered several standards obsolete. In this context, the CCAP 2020 will support the revision every three years of Québec standards governing such appliances, starting in 2013. The legislation that frames the regulation will also be updated in order to broaden the regulation's powers and scope. The regulation amendments are intended to ensure that Quebecers benefit from the most efficient appliances on the market.

4 STRENGTHEN QUÉBEC SOCIETY'S RESILIENCE TO CLIMATE CHANGE IMPACTS

Aside from the transversal initiatives dealing with adaptation to climate change presented in section 2, the CCAP 2020 will support initiatives specific to health, the economy, infrastructure and the natural environment with a view to strengthening Québec society's resilience to climate change.

Québec's health vision in the context of climate change

By 2020 and beyond, despite changes in Québec's climate, the increased frequency and intensity of extreme weather events and disasters, the health of individuals and communities will be preserved.

4.1 MAINTAIN THE HEALTH OF INDIVIDUALS AND COMMUNITIES

Rising average temperatures and the greater frequency and severity of heatwaves and extreme weather events can significantly affect Quebecers' physical and mental health. Climate change is likely to affect health, especially that of young children, seniors and certain individuals whose physical condition, economic situation or geographic location make them sensitive or vulnerable. This situation demands immediate preventive action and solid preparation for the climate hazards.

Regarding public health, the CCAP 2020 is built on the initiatives undertaken in the previous plan and elaborates new initiatives. Priority has been given to initiatives centred on the enhancement of air quality, the prevention of the impact of heatwaves and the prevention and elimination of heat islands. The same applies to the prevention and reduction of psychosocial impact related to disasters stemming from climate change, an area for action in which several needs have been defined.

Why strengthen Québec society's resilience?

A society whose resilience is robust is better able to cope with new threats and extreme weather events by adapting (by resisting or changing) in order to limit the social, economic and environmental repercussions stemming from climate change.

Priority 26: Prevent and limit diseases, injuries, mortality and psychosocial impacts

The impact on health of rising average summer temperatures stems primarily from the degradation of air quality through increased smog formation. This leads to an increase in the gravity and frequency of asthma attacks and respiratory and heart problems. The same goes for heatwaves, which reduce the human body's ability to resist the adverse effects of pollutants, increases the risk of heatstroke and aggravates chronic diseases such as diabetes, respiratory failure and cardiovascular problems. Heat islands exacerbate such problems, which leads to an increase in visits to emergency rooms, hospitalization, and the number of premature deaths. Lastly, extreme weather events such as flooding or landslides can have a significant psychosocial impact on disaster victims.

Air quality

To limit airborne pollutants and reduce the attendant mortality and morbidity, the government will elaborate and implement a Québec air quality policy, which will promote local and regional air quality management. Communities will thus be better equipped to handle the challenges posed by air quality management and adaptation to climate change.

Prevention and intervention during heatwaves

In addition to further developing knowledge in the field, the government intends to reinforce monitoring and surveillance systems and initiatives that allow for more efficient, prompter interventions during heatwaves. It will also establish telephone alert systems and personalized, automated Internet services for certain groups of vulnerable individuals.

The fight against heat islands

Within the framework of the CCAP 2006-2012, the municipalities implemented several pilot projects to eliminate existing heat islands in urban environments or prevent them. Mention should be made of tree planting, the construction of shade areas, the use of reflective materials, the preservation of existing cool zones (wetlands, wooded areas, and so on), the installation of green roofs, and the upgrading of buildings. The government intends to pursue initiatives aimed at eliminating heat islands in municipalities by supporting the training of specialized teams and implementing financial incentive measures. Priority will be given to initiatives aimed at vulnerable populations, e.g. seniors' centres, and that rely on cooperative resources or the social economy. A voluntary standard from the Bureau de normalisation du Québec is also being elaborated to plan public parking lots in a perspective of reducing urban heat islands.

Moreover, several government policy directions that will be elaborated within the framework of the revision of the legislation governing land-use planning and urban planning will take into account this problem in order to prevent the appearance of new heat islands when urban development or redevelopment is under way, especially through the preservation of existing cool zones.

Psychosocial impact of disasters related to climate hazards

The victims of disasters (freezing rain, high tides, flooding) are subject to acute distress because of the significant losses sustained, e.g. death, job loss, loss of housing, and the many steps that must be undertaken related to insurance, transfers, and so on. The government therefore intends to enhance the assistance and psychosocial support measures offered to the population in the wake of such events, such as screening for mental health problems among disaster victims and the enhancement of information and training tools and methods intended for the general public, organizations, medical staff, and elected officials. The government will also evaluate the relevance and feasibility of establishing a monitoring system focusing on the psychosocial impact of extreme weather events in order to plan the appropriate measures to assist the disaster victims.

4.2 PRESERVE ECONOMIC PROSPERITY

The degree of vulnerability of economic activity in the face of climate change varies according to the company, since it depends, among other things, on the location, the sector of activity, the clientele targeted or the resources and networks involved. Extreme weather events and climate change impacts are already affecting Québec businesses, whether from the standpoint of infrastructure, supply or distribution chains, operations, profitability, customer traffic, or employee absenteeism. In order to preserve economic prosperity, vulnerable economic players in Québec must receive guidance and support in their adaptation approach and be encouraged to seize new business opportunities and to innovate. To this end, the government will invest in the implementation of adaptation solutions centred on the resilience of economic activity that ensures Québec's economic prosperity.

Québec's economic vision in the context of climate change

By 2020 and beyond, Québec firms that are likely to be affected by climate change will be aware of their vulnerability. They will be able to protect themselves from the adverse impact and seize new opportunities stemming from climate change, thereby ensuring the resilience of their economic activity and the Québec economy.

Priority 27: Support vulnerable economic players

The government will initially establish financial support and a guidance service to encourage businesses to take into account adaptation to climate change in their practices. It will encourage them to adopt preventive measures and prepare to cope with disasters. It will support the economic recovery of businesses affected by disasters related to climate change. The jobs of workers in sectors that are vulnerable to climate change will thus be better preserved, either through the transition to other types of activity or the quicker resumption of activity after the disaster.

Moreover, while all of Québec's economic sectors are vulnerable to climate change, some are more vulnerable than others, in particular when they depend directly on natural resources or climatic conditions. This is true of forestry, agriculture, tourism and mining operations.

Facing the elements, strengthening the resilience of businesses to climate change

"In a changing climate, firms that routinely incorporate climate change impacts and adaptation in major investment decisions and in decisions with long-term consequences will be better off than their competitors."

NRTEE, 2012

Forestry

In a context where climate change and its impact risk being progressive and cumulative, it is important to document such change and anticipate its impact on Québec forests. To this end, the investigations undertaken within the framework of the CCAP 2006-2012 will continue and will enable stakeholders in the sector to adopt preventive, adaptive management of Québec's forest resources. Some examples are the evaluation of the impact of climate change on forest productivity, updating the approach to the management of natural disturbances and transferring the knowledge acquired to decision-makers and regional stakeholders so that it can be integrated into forest management.

Agriculture

The agriculture sector must also be able to adapt to the new challenges posed by climate change. The government is proposing adaptation solutions that affect the agronomic, phytosanitary and hydric facets of agriculture and that will reduce the agricultural sector's vulnerability to climate change. The CCAP 2020 will thus support phytosanitary monitoring and the diagnosis of pests already found in Québec. The government will also ensure monitoring, knowledge transfers and early detection of new pests with a view to adjusting intervention strategies. Moreover, it will promote the responsible use of water resources in the agricultural sector. Lastly, it will support the implementation of soil conservation and biodiversity protection practices against a backdrop of adaptation to climate change, in particular through agroforestry development.

The tourism industry

The tourism industry, which depends both on natural resources and climatic conditions, will face numerous challenges against a backdrop of climate change (more frequent winter mild spells, extreme weather events, longer summers, and so on). To protect themselves from undesirable impacts, overcome the anticipated consequences or seize new opportunities stemming from climate change, tourism enterprises must adapt their products or rely on the elaboration of substitute products. Regional vulnerability analyses will be conducted to inform tourism enterprises of the challenges that they will have to meet in the future and guide them in their adaptation approaches. To this end, the government will elaborate and publish, in particular, a guide to inform tourism industry stakeholders about the adaptation solutions available to them.

Mining operations

The government plans to make northern Québec a vast economic, social and environmental development project. Mining operations, which are already a major component of the economy of northern Québec, will develop further. There are already 10 new mining projects that could be launched in the coming years in the territory that the Plan Nord covers. The realization of analyses of the hazards linked to the industry will reveal the impact of climate change on mining operations. The government will then be in a position to target the industry's vulnerability and reexamine certain technical criteria pertaining, for example, to the management of mine tailings and the use of water resources. Mining enterprises will also have available the necessary knowledge to implement the appropriate adaptation solutions.

4.3 STRENGTHEN THE DURABILITY AND SAFETY OF BUILDINGS AND INFRASTRUCTURE

In view of the vital role that buildings and infrastructure play in our society, we must accord them special attention against a backdrop of climate change. The collapse of several electric power transmission lines in the Montérégie region during the 1998 ice storm and the damage caused to buildings and transportation infrastructure during successive marine submersion and flooding events that affected areas of eastern Québec in 2010 reveal Québec society's vulnerability to climate hazards.

Québec's infrastructure vision in the context of climate change

By 2020 and beyond, the durability and safety of the buildings and infrastructure mostly likely to be affected by climate change impacts will be ensured through design, management and maintenance adapted to a context of climate change.

The design, management and maintenance of infrastructure and buildings and their physical protection against unknown factors or their relocation in safe areas are also key components of an effective adaptation strategy. The renewal and rehabilitation of our built environment affords a unique opportunity to immediately adapt to future climatic conditions.

Within the framework of the CCAP 2006-2012, several research projects were launched in order to assess the impact of climate change on transportation infrastructure in northern Québec and in several regions of the Gulf of St. Lawrence and the St. Lawrence estuary. In Nunavik, the projects focused, among other things, on the vulnerability of airport, maritime and road infrastructure and the applicability of adaptation methods, in particular regarding melting permafrost. Research is also under way on the vulnerability of road infrastructure and seawalls to protect against coastal erosion in the Bas-Saint-Laurent, Côte-Nord, Gaspésie and Îles-de-la-Madeleine regions, where the provincial road network closely follows the coast.

Priority 28: Revise infrastructure design criteria and management and maintenance methods

Some infrastructure is likely to be affected by climate change through changes in the conditions to which it is exposed or unexpected extreme weather events. In this context, the CCAP 2020 pays particular attention to the infrastructure most likely to be affected by climate change impacts in order to strengthen its resilience.

As for transportation, several types of infrastructure are concerned, such as roads, railroad lines, ports, bridges, culverts, seawalls, and so on. The government will, therefore, implement adaptation solutions aimed at reinforcing the management and maintenance of existing infrastructure in a context of climate change and will integrate adapted design criteria for the new infrastructure. Special attention will be accorded, in particular, to transportation infrastructure built on the permafrost in Nunavik. The projects will hinge on the most recent outcomes of research, experimentation and monitoring. The government will also ensure that public services are maintained during extreme hydrometeorological and geological events by implementing preventive measures geared to effective, adapted intervention.

The government will adapt the management of public dams to new climatic conditions by elaborating decision support tools to adapt the parameters of the management plans of public dams to anticipated fluctuations in water balance. Moreover, Hydro-Québec will pursue its initiatives aimed at the continuous improvement of its electricity transmission and distribution networks.

What is the resilience of an ecosystem?

The resilience of an ecosystem refers to its ability to resist and survive disturbances that affect its composition and functioning.

Climate change is likely to alter the composition and structure of ecosystems. It threatens *ipso facto* the ability of our natural environment to render the ecological services on which we depend. Given that ecosystems that display greater biological diversity and are in generally good health are more resilient to disturbances, including those stemming from climate change, the CCAP 2020 will pay special attention to these aspects.

The services that aquatic ecosystems provide are especially crucial from a social, economic and environmental standpoint in Québec. We need only to think of drinking water, hydroelectricity generation, freight and passenger transportation by navigable waterway, and tourist activities such as fishing or swimming to be convinced of it. Possible variations in water resources resulting from climate change will certainly affect the benefits that we derive from such resources. In this context, it is important to pay special attention to conservation and the management of water resources. Through the CCAP 2020, the government will examine water resource management in terms of the anticipated impact of climate change.

4.4 PRESERVE BIODIVERSITY AND THE BENEFITS THAT ECOSYSTEMS OFFER

Quebecers' well-being and Québec's economic prosperity depend on the numerous benefits that ecosystems offer. Natural environments provide a vast array of services, e.g. provisioning services such as water, pharmaceutical products, food, and materials; regulating services such as climate control or control over shoreline erosion; cultural services such as recreation, tourism, and the psychological benefits of green spaces; and support services such as the formation of soil and oxygen production.

Québec's ecosystem conservation vision in the context of climate change

By 2020 and beyond, the adaptation of the management of water resources, biodiversity and ecosystems to climate change will foster the resilience of ecosystems and the maintenance of the essential ecological services that contribute to Quebecers' well-being and prosperity.

Priority 29: Update biodiversity and ecosystem evaluation, protection and management tools

To preserve the resilience of ecosystems, we must thus ensure the sustainable protection and management of species and populations, recognize the most resilient or the most vulnerable natural or built habitats, and ensure the maintenance of ecological services and the benefits that they afford society.

Accordingly, the government will establish the level of vulnerability of ecosystems and fauna and flora species that are of major environmental, economic or social importance in Québec, including threatened and vulnerable species. It will examine the entry routes and propagation methods of invasive exotic species that climate change favours with a view to implementing adapted detection and control methods. Moreover, the impact of climate change on aquatic and land wildlife species, in particular those that are harvested, will be evaluated so that the management of the species and their habitat can be adapted to new climatic conditions.

As for habitats and ecosystems, those that are already subject to intensive anthropogenic pressure (wildland urban interfaces, agri-environments, wetlands and forest environments) are more vulnerable to climate change impacts. A climate change vulnerability index pertaining to natural environments in southern Québec, adaptation measures in agri-environments and wildland urban interfaces and a strategy to protect and manage resilient or vulnerable ecosystems in southern Québec will be developed to foster the resilience of fragile ecosystems.

Moreover, the monetary value of ecological services has not been estimated to date and is rarely taken into account in the decision-making process, in particular in the field of land-use planning. This gap in our knowledge poses a genuine threat for the protection and conservation of our natural environment, which is of vital importance for the well-being and prosperity of our society. Since climate change is likely to increase pressure on biodiversity and ecosystems, the CCAP 2020 will support the conception of new tools designed to estimate the monetary value of the ecological services that they generate in order to promote their conservation and thus preserve the benefits that they offer us.

Priority 30: Update knowledge and adapt water resource management tools

Efficient management of water resources in a context of climate change requires the acquisition, modelling, analysis and harnessing of data on the levels and quality of surface water and groundwater. The adaptation of management tools must also be carried out according to the projected changes.

The CCAP 2020 will ensure the long-term survival of hydrometric and groundwater monitoring networks and will thus maximize hydrological and piezometric knowledge (collection, validation and access to data). Moreover, a hydrological modelling platform elaborated within the framework of the CCAP 2006-2012 will be extended to all of Québec's southern drainage basins as well as future hydroclimatic projections. Several hydrological indicators and hydric resource management tools will also be updated according to the most recent data and climate projections. They will, in particular, make it possible to better manage stream discharges to avoid floods and maintain a sufficient water level during droughts to preserve the health of aquatic ecosystems.

5 STAY ON COURSE: COORDINATION, FOLLOW-UP AND ACCOUNTABILITY

In their capacity as partners of the Québec government in the fight against climate change, Quebecers, businesses and communities must be informed of progress stemming from the investments made to reduce GHG and adapt to climate change within the framework of the CCAP 2020.

Coordination, follow-up and accountability

Each year, under the direction of the MDDEP, the government will publish a progress report on the implementation of the priorities defined in the CCAP 2020. The report will present data on the implementation of initiatives and programs stemming from the 30 priorities and their cost, as well as concrete examples of achievements. Data from the annual GHG emission inventory and the review of transactions related to the GHG emission cap-and-trade system are other follow-up tools.

The government also intends to more exhaustively monitor changes in progress achieved through the implementation of the priorities in the CCAP 2020. To this end, a more general review of spinoff will be elaborated every three years according to the following approach:

- Emissions that are reduced or avoided that can be accounted for with a sufficient degree of confidence according to existing protocols or other methodologies will be presented in association with the specific priority of the CCAP 2020 from which they stem. For example, it will be possible to account for GHG reductions obtained through the installation of an energy efficiency device in an industrial establishment or the conversion of an oil-fired building heating system to electricity.
- In some instances it is difficult to quantify the impact of initiatives or programs for various reasons (diffuse impact, absence of protocols, technical complexity or very high cost) or the impact is of a qualitative nature. It may also be difficult to isolate their impact from that of other variables, e.g. other priorities in the CCAP 2020, complementary policies and socioeconomic factors. In such situations, an analysis by sector rather than by priority will be emphasized to better account for the impact of the initiative or program. In this context, the use of macroeconomic indicators may reveal current trends in a sector or highlight the economic, social or environmental benefits linked to each priority. For example, growth in mass transit ridership in Québec or its mode share with respect to other modes of transportation might clearly indicate the combined success of measures aimed at the enhancement of the public transit service offer and greater densification of urban environments. Such growth would indicate that Québec is on the right track, without necessarily distinguishing the impact of investments and initiatives under the CCAP 2020 in the realm of public transit from other government action.

- In the realm of adaptation, the *2013-2020 Government Strategy for Climate Change Adaptation* is the cornerstone of initiatives in this field in Québec. The review that will be conducted will thus highlight how the priorities in the CCAP 2020 have contributed to the attainment of the objectives in the Strategy. It will be crucial to pinpoint vulnerabilities in this process to ascertain whether the initiatives implemented mitigate them.

Moreover, this approach responds to the key recommendations of the Auditor General in the spring of 2012, which direct the MDDEP to further evaluate GHG reductions and the efficiency of the measures proposed. More specifically, to carry out the recommendations overall and constantly enhance its procedures, the MDDEP intends to establish a project office that will be responsible, in particular, for developing an integrated management framework for the CCAP 2020. The framework will include clear guidelines concerning the purposes and objectives sought under the CCAP 2020 and the quality of the data associated with the quantification of GHG emission reductions. It will also define the roles and responsibilities of stakeholders in the CCAP 2020.

The project office team will establish detailed planning of the implementation of the CCAP 2020 in order to monitor its outcomes more closely. In the same way, it will ensure follow-up of its financial framework to foster optimal, efficient use of financial resources. To this end, it will, in particular, produce performance indicators that allow for accurate monitoring of deadlines, the budgets granted and government expenditure on all of the programs stemming from the priorities pinpointed in this action plan.

In this context, the efficiency and effectiveness of the priorities defined in the CCAP 2020 will also be thoroughly examined to more rapidly identify discrepancies between actual and anticipated results and foster the adoption of timely remedial measures. The cost per ton of reduced GHG will be one of the performance indicators. However, other indicators will also be used to take into account the numerous benefits stemming from the implementation of the priorities in the CCAP 2020 and the complexity of the factors that underpin it.

In its capacity as the coordinator of the CCAP 2020, the MDDEP will also ensure the coherence of the initiatives that government departments and bodies carry out. It will collaborate with the departments and bodies to ensure that government initiatives overall respect the objectives set by the CCAP 2020. To this end, in the coming months, the MDDEP will specify with the departments concerned the targets and indicators pertaining to the programs that stem from the priorities in the CCAP 2020. The existing interdepartmental coordination mechanisms will be reviewed and new mechanisms may be introduced to ensure better coordination of the action plan.

Development of government expertise in the field of climate change

The production of studies designed to broaden our knowledge of reduction potentials in each sector will support the ongoing process of bolstering the CCAP 2020, in particular from the standpoint of the relevance of new priorities, initiatives and programs aimed at contributing to the attainment of climate change objectives. The studies will pinpoint the most effective measures and optimize the elaboration of programs.

The government will also maintain cutting-edge expertise in the realm of climate change linked to scientific research and changing public policy in North America and abroad. Indeed, scientific knowledge is changing very rapidly as regards life-cycle analysis, GHG emission accounting and understanding of the cross-impacts of climate-related initiatives. The same is true of knowledge of adaptation. The government will base the assessment of the attendant GHG reductions and the choice of the initiatives to be emphasized on a solid scientific footing. Efforts will be pursued to enhance the data presented in Québec's GHG inventory to ensure that it properly reflects the outcomes of initiatives under the CCAP 2020.

Changes in the CCAP 2020 and advisory committee

The CCAP 2020 will be reviewed at midpoint to ensure that the efficacy of the initiatives is maximized and to optimize the use of the funds available to attain the objectives set. The second phase of the CCAP 2020 will thus be elaborated in light of the revenue that the carbon market generates, progress achieved in our initiatives and new policy directions governing sustainable mobility, land-use planning and energy.

Beyond the follow-up carried out by the MDDEP and government departments on the priorities in the CCAP 2020, a new consultation mechanism will be implemented. Indeed, the CCAP 2020 advisory committee, set up in December 2010 to advise the Minister of Sustainable Development, Environment and Parks on the elaboration of the action plan will be expanded and become an advisory committee on follow-up to and the implementation of the CCAP 2020. The committee will be representative of the priority sectors in the action plan and will meet periodically to take stock of the state of advancement of the plan and advise the Minister on other possible measures or the enhancement of the measures under way. Meetings open to the public will be held periodically to foster public support for climate change action.

The CCAP 2020 is an open-ended action plan that will adjust to the development of Québec society.

Funding of the CCAP 2020

The CCAP 2006-2012 was, by and large, funded through a levy on fuel and fossil fuels, which generates $200 million in revenue annually. The royalty will be extended until December 2014 to contribute to the funding of the CCAP 2020.

However, funding for the CCAP 2020 hinges mainly on the GHG emission cap-and-trade system. Indeed, the revenue from the auctioning by the Québec government of emission allowances under the system will be paid into the Green Fund and be used to fund the CCAP 2020. The level of funding will depend on changes in the price of carbon on the market. The budgets announced in the action plan hinge on the minimum anticipated revenues, bearing in mind that the floor price of $10/ton of GHG, indexed annually, was set in the GHG emission cap-and-trade system starting in 2012. Additional revenue might be available from year to year and will then be earmarked for initiatives already under way or new measures following an analysis of the initiatives likely to contribute more significantly to the attainment of the objectives of the CCAP 2020.

6 ADVANCING TO THE 2020 TARGET: DATA

Québec has set as its target a 20% reduction by 2020 in its GHG emissions in relation to 1990. A target of this scope is, in itself, already ambitious and it is all the more so for Québec.

Unlike a number of other jurisdictions, Québec does not have significant emission reduction potential in its electricity generation sector, since 97% of its electricity already comes from renewable sources. In this context, it is, above all, the transportation, industry and building sectors that will be called upon to reduce Québec's GHG emissions.

Furthermore, a great deal of effort has already been invested in Québec since 2006 in the field of climate change. Forthcoming reductions will thus be harder to achieve given the considerable effort made in recent years, in particular in the industrial sector. The reductions will have to centre on technology but also on a sweeping review of our behaviour and ways of doing things.

Québec is firmly committed to this course in the long term to benefit from the substantial attendant spinoff for Quebecers, businesses and Québec society as a whole, both from an economic standpoint and in terms of quality of life. The measures that are geared both to the attainment of the 2020 target and to maximizing positive spinoff for Québec will be emphasized, as well as those that lead to a sweeping medium- and long-term transformation of markets and habits.

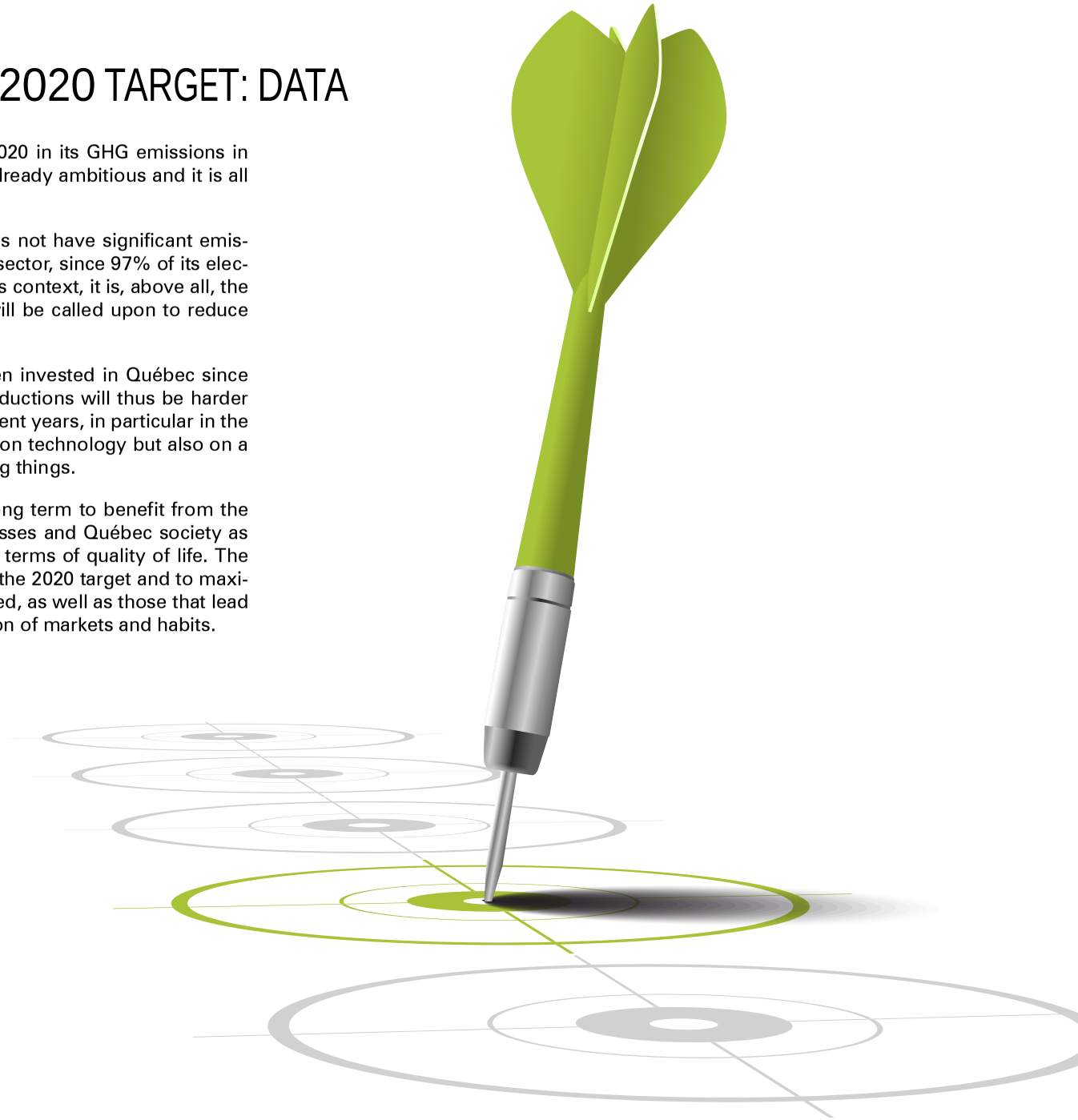
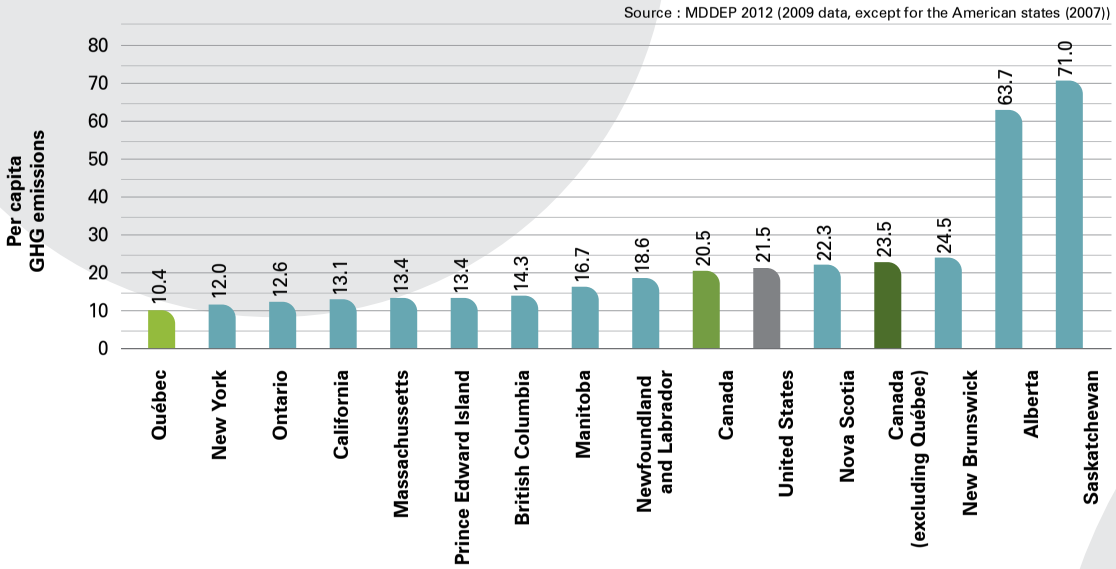


Chart 1: Per capita GHG emissions in Canada and the United States

(in tons of CO_2 equivalent per capita)



Profile of Québec's GHG emissions in 2009

In 2009, Québec's total GHG emissions stood at 81.8 megatons of CO_2 equivalent, which represents 10.4 tons of GHG per capita, the lowest ratio in all of the Canadian provinces.

Transportation accounts for 43.5% of Québec's GHG emissions and now ranks first among the heaviest GHG emitters. For this reason, two-thirds of funding under the CCAP 2020 is devoted to the sector. Industry ranks second, then the building sector, followed by the agriculture, residual materials and electricity sectors.

Chart 2: Breakdown of Québec's GHG emissions in 2009

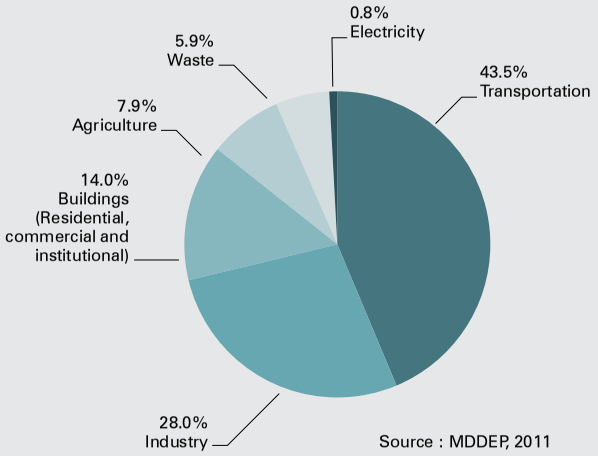


Table 1: GHG emissions by economic sector

Transportation 1990: 27.4 MT of CO_2 equivalent 2009: 35.6 MT of CO_2 equivalent Change: +30%	Among all sectors, the transportation sector experienced the biggest increase between 1990 and 2009, i.e. 30%. Road transport is mainly responsible for the increase, i.e. 83% or nearly 7 MT. Pickup trucks, minivans and sport utility vehicles accounted for a larger proportion of the vehicle fleet in 2009 than in 1990. Moreover, significant growth was noted in freight hauling by truck.
Industry 1990: 30.6 MT of CO_2 equivalent 2009: 22.9 MT of CO_2 equivalent Change: -25%	Among the factors that explain the striking decrease in GHG emissions in the industry sector since 1990, an appreciable decline was noted in the consumption of fuel oil and natural gas, a marked increase in the use of electricity, technological improvements to processes between 1990 and 2009 in most sectors, and temporary or permanent plant closings. It should be noted that a considerable portion of the reduction in industrial emissions occurred in the pulp and paper sector (over 3 MT).
Buildings (Residential, commercial and institutional) 1990: 10.8 MT of CO_2 equivalent 2009: 11.4 MT of CO_2 equivalent Change: +6%	The growth observed in GHG emissions in the building sector since 1990 is attributable to the development of the commercial and institutional sector, which is relying increasingly on natural gas. The conversion of the Québec economy from a mainly manufacturing economy to a service-centred economy underpins this trend. Emissions in the residential sector have declined by 43% since 1990 although the population has increased by 12% during the same period, in particular because of the conversion of oil-fired heating systems to electricity.
Electricity 1990: 1.5 MT of CO_2 equivalent 2009: 0.6 MT of CO_2 equivalent Change: -60%	Electricity generation in Québec is rather unique in that nearly 97% of it relied on renewable energy sources in 2009. Less than 1% of the electricity generated in Québec is derived from the combustion of fossil fuels and it is the emissions linked to such fuels that stand out in the inventory. The emissions can vary significantly from one year to the next depending on the use of power plants that operate with fossil energy, especially to satisfy heating needs during extremely cold weather.
Agriculture 1990: 6.3 MT of CO_2 equivalent 2009: 6.5 MT of CO_2 equivalent Change: +2.5%	GHG emissions in the agricultural sector have been fairly stable in Québec since 1990.
Residual materials 1990: 7.2 MT of CO_2 equivalent 2009: 4.8 MT of CO_2 equivalent Change: -34%	GHG emissions in the residual materials sector have declined substantially since 1990, mainly because of the capture and burning of biogas in several landfills. This trend should continue in the coming years in the wake of the implementation of the *Québec Policy on Waste Management* and the attendant *2011-2015 Action Plan,* which, among other things, seeks to banish by 2020 the landfilling of putrescible organic waste.

Emissions forecasts for 2020

To grasp the scope of the challenge to be met in terms of GHG emission reduction, a reference scenario on the change in GHG emissions for 2020 was elaborated in December 2011. It presents the normal course of business (NCB), which hinges on several socioeconomic hypotheses deemed to be the most likely at the time the scenario is designed. The NCB takes into account macroeconomic factors such as the price of oil, in respect of which long-term predictive estimates come from national and international agencies recognized for their expertise in this field. It also considers more specific factors known to the government that may significantly affect changes in GHG emissions in a given sector when their probability of realization, e.g. new development projects, or the extent of their impact on GHG, e.g. regulations or government strategies or policies, is deemed to be sufficiently high.

Socioeconomic hypotheses of the 2011 NCB
(expressed as average annual growth between 2006 and 2020)

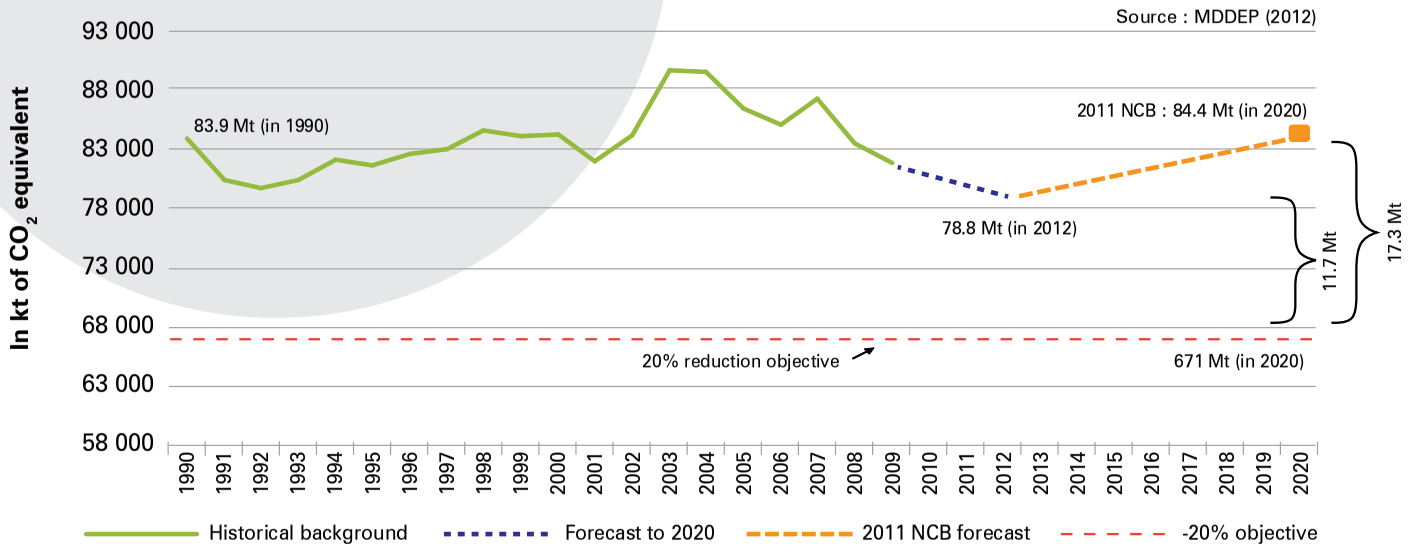
- Real gross domestic product (GDP): 1.8%
- Inflation: 2.0%
- Demography: 0.8%
- Canadian dollar at par with the US dollar in the long term
- Price of a barrel of oil in 2020: US$99 (2009), US$119 (current dollars in 2020)

The factors considered in the NCB can vary significantly by 2020 and appreciably affect the estimate of the GHG reduction effort to be made for 2020 to attain Québec's GHG emission reduction target. Certain factors have an especially marked impact since they affect all economic sectors and individual behaviour. Accordingly, an increase or a decrease in the price of a barrel of oil will affect economic development and emissions in the industrial and transportation sectors and the travel choices of individuals.

The NCB will, therefore, be reevaluated regularly between now and 2020 to take into account variations in these factors. This will enable the Québec government to better gauge changes in the effort to reduce GHG that must be made and to adapt its climate change interventions accordingly.

The 2011 NCB banks on a reduction of GHG emissions in Québec that is 6% below the 1990 level. Subsequently, between 2012 and 2020, growth in GHG emissions is anticipated. According to this scenario, GHG emissions should stand at 84.4 MT in 2020, a level slightly above the 1990 level (83.9 MT). Accordingly, to achieve by 2020 the GHG reduction target of 20% below the 1990 level (67.1 MT), the 2011 NCB indicates that GHG emissions should be reduced by roughly 17 MT in 2020 (Chart 3). In relation to the estimated level for 2012, the GHG emission reduction would stand at 11.7 MT.

Chart 3: Québec's forecast GHG emissions for 2020 according to the normal course of business in 2011



This profile of GHG emissions for 2020 is changing constantly. However, it does offer a glimpse of the profile of Québec's GHG emissions in 2020 in the absence of the CCAP 2020 and other complementary government intervention that lower GHG emissions and assuming that the hypotheses defined materialize. It shows the importance for the Québec government of pursuing, indeed of stepping up, its efforts to fight climate change.

The Québec government's adoption of the 2020 target

The Québec government adopted its GHG emission reduction target of 20% below the 1990 level in November 2009, in the wake of a sweeping consultation by the Committee on Transport and the Environment in the National Assembly of Québec. In the public consultation paper prepared at that time, the government compared different reduction target scenarios for Québec, ranging from 10% to 20%, with those of its partners under the Western Climate Initiative (WCI). The 20% target, which ranked Québec as the lowest per capita emitter of GHG in the WCI, is the one that rallied most stakeholders at the public consultation.

The attainment of the target through the GHG emission cap-and-trade system

The GHG emission cap-and-trade system leads to the attainment of Québec's reduction target of 20% below the 1990 in the North American carbon market. Indeed, it imposes an emission cap which affects the key sources of GHG emissions, i.e. the industrial, transportation and building sectors, which account for over 85% of Québec's overall emissions. Since the GHG emission cap-and-trade system cap is degressive, it leads to an absolute reduction in 2020 of the combined GHG emissions in the participating states or provinces. The GHG emission cap-and-trade system has been calibrated in such a way that the sectors that emit GHG that are not directly covered by the system are also contributing adequately to the GHG emission reduction effort in Québec.

However, the system does not guarantee that GHG emission reductions will occur in Québec. Indeed, on the carbon market, an enterprise subject to an emission cap may choose to reduce its emissions to comply with the regulation or purchase emission allowances or offset credits on the WCI market. Such allowances or credits may come from Québec but also from other jurisdictions participating in the carbon market.

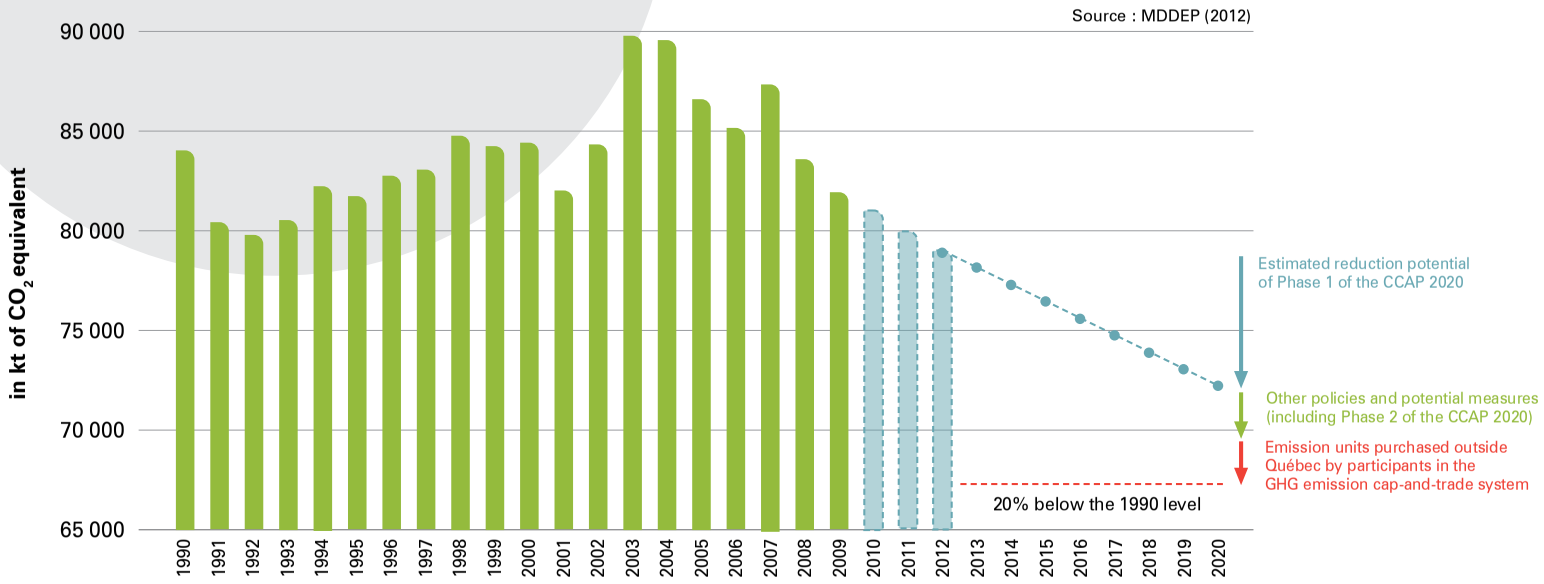
Enterprises and participants in the market, not the government, make the purchases in question. Indeed, recourse to external government purchases to attain Québec's GHG emission reduction target is not currently being contemplated. The government is relying instead on market forces, the current CCAP and other allied government strategies, policies and measures to ensure that the reductions are achieved as much as possible in Québec.

The CCAP 2020: Reduce emissions… in Québec

To ensure that emission reductions are achieved as much as possible in Québec and that Quebecers and the Québec economy thus fully take advantage of the benefits linked to climate change action, the government is using the revenue generated by the sale of emission allowances under the GHG emission cap-and-trade system to invest in GHG emission reductions in Québec.

The CCAP 2020 therefore presents an array of initiatives that will be implemented to achieve emission reductions in Québec. The priorities defined in the CCAP 2020, combined with other government initiatives already announced, offer significant GHG reduction potential in the key GHG emitting sectors in Québec. According to the investigations conducted when the CCAP 2020 was elaborated, the priorities formulated to date could generate potential GHG reductions on the order of 6 MT for 2020 (see Chart 4). This quantification is an estimate and the potential will be reassessed periodically according to the revisions of the NCB and bearing in mind data that will become available following the implementation of the initiatives and programs in the CCAP 2020.

Chart 4: Contribution of the CCAP 2020 and other potential policies and initiatives to the attainment of Québec's reduction target for 2020



The CCAP 2020 will be open-ended and other initiatives will be added to it during the period 2013-2020 according to Québec's progress in the attainment of its target and the funds available. Indeed, in several sectors, studies are underway or will be conducted to determine the additional initiatives most likely to generate GHG reductions in Québec and engender considerable medium- and long-term benefits for Québec society. A long-term perspective is needed since the effort made by 2020 to reduce GHG will initiate an even broader transformation by 2030 and beyond.

Moreover, given that the GHG emission reduction is a government objective, other strategies, policies and initiatives will be added to the CCAP 2020 to further contribute to GHG emission reductions in Québec. Mention should be made, in this respect, of the future Québec policy on sustainable mobility and the impending *Sustainable Regional and Local Land Use Planning Act* through which the government wishes to elaborate a perspective that integrates all facets of sustainable development, or the overall energy efficiency plan and the *Québec Energy Strategy 2006-2015* that should be renewed by 2020. The policies will lead, in particular, to major changes in behaviour and energy performance. Phase 2 of the CCAP 2020 can take them into consideration and propose additional initiatives to bolster their impact.

The implementation of the CCAP 2020 requires the establishment of dynamic partnerships between the government and key interveners in Québec society. The municipalities are at the forefront in the fight against climate change by virtue of their power of influence over land occupancy and urbanization. We hope that the municipal sector will pursue its contribution to the identification of solutions to GHG emission reduction and adaptation to climate change in Québec.

The attainment of Québec's reduction target poses a daunting challenge to which society as a whole is being asked to contribute. The Québec government is playing a leading role in this respect and will establish conditions that enable the Québec economy to benefit to the utmost from positive spinoff from the fight against climate change.

7 CONCLUSION

The success of the fight against climate change requires a major change of direction in terms of collective and individual choices. Indeed, the GHG emission reductions necessary for 2020 and beyond hinge on the ability of societies to develop, produce, consume and travel differently. In light of its energy profile and the importance that Quebecers attach to environmental protection, Québec is in a very good position to take advantage of this shift.

We are determined to pursue our initiatives to fight climate change on two complementary, indissociable fronts, i.e. the reduction of GHG emissions and adaptation to climate change. This challenge affords Québec an outstanding opportunity to reduce its dependence on fossil energy, which is primarily responsible for our GHG emissions, accelerate the transition to a green economy and thus ensure current and future generations of Quebecers a healthy, prosperous future in a perspective of sustainable development.

To act immediately to take into account changing climatic conditions and greater threats posed by extreme weather events in territorial development and our societal choices will enable us to prevent or reduce adverse impact for communities, infrastructure and ecosystems. To act immediately to enhance our energy efficiency and rely resolutely on renewable energies will enable us both to reduce our GHG emissions and our vulnerability to anticipated increases in oil prices. These initiatives require, of course, initial investments or changes in our ways of doing things, which will, however, be less substantial than they would be if we fail to act promptly. By planning today the development of an even more efficient Québec, by investing now instead of postponing decisions, we are also reducing the impact of climate change on our future public finances. To maintain the ability of generations to invest in their quality of life is a question of intergenerational fairness and responsible societal choices. That is the choice that we are making.

The attainment of objectives requires the mobilization and commitment of all partners and key players in communities in the municipal sector, industry, private enterprises or community organizations. An integrated perspective that encompasses all sectors of activity and vigorous, structuring, coherent initiatives will be necessary to ensure the realization of our societal project. To this effect, the CCAP 2020 poses a basic milestone but that marks only one stage in the fight against climate change.

For this reason, the CCAP 2020 is open-ended and will adapt to our evolving ambitions, needs and society. The CCAP 2020 also belongs to all Quebecers and we are relying on the commitment of everyone in the coming years to tell us how to go further in the fight against climate change and in respect of sustainable development for the benefit of Quebecers now and in the future. The dialogue is open.

APPENDIX Funding breakdown of the 2013-2020 Climate Change Action Plan priorities

PRIORITIES		BUDGET ($ MILLIONS)
Plan – Québec communities at the forefront		
1	Foster sustainable land-use planning of the territory in a perspective of combating climate change	6.0
2	Support municipal and community initiatives to reduce GHG, adapt to climate change, and engage in sustainable land-use planning	94.0
3	Promote risk management that minimizes the vulnerability of communities	21.2
Innovate – Develop knowledge and technology		
4	Support innovation and research and the development, demonstration and marketing of technologies aimed at reducing GHG emissions	40.0
5	Pursue the development of climatological monitoring networks	15.0
6	Support research in adaptation	45.6
Mobilize – Engage the population and partners in action		
7	Disseminate knowledge, know-how and solutions pertaining to GHG reduction and adaptation to climate change	26.5
8	Mobilize Québec by supporting initiatives in civil society and in communities	44.0
9	Raise Québec's profile in Canada and on the international scene	2.5
Lead the way – Québec government committed to set the example		
10	Integrate the concern for climate change into the public administration	4.5
11	Foster a reduction of GHG generated by the operations of the public administration	14.0
Establish a carbon market		
12	Send a carbon price signal by establishing a GHG emission cap-and-trade system	8.0
Foster the sustainable mobility of people and goods		
13	Promote public transit and alternative transportation by enhancing their availability, developing infrastructure and facilitating sustainable choices	1,536.7
14	Create a greener car fleet through more fuel-efficient and better maintained vehicles	40.0
15	Invest in intermodality and logistics to optimize freight and passenger transportation	85.0
16	Enhance the efficiency of maritime, rail, air and off-road transportation	38.0

PRIORITIES		BUDGET ($ MILLIONS)
17	Reduce the environmental footprint of road freight transport	77.0
Support Québec firms in the transition to a lower carbon economy		
18	Enhance the carbon balance and energy efficiency of Québec firms	200.0
Foster the emergence of sustainable buildings		
19	Adopt greener building standards	34.0
20	Promote renewable energies and energy efficiency in residential, commercial and institutional buildings	123.3
21	Reduce the use of halocarbons	19.7
Contribute to the development of sustainable agriculture		
22	Equip farmers to better manage GHG emissions from crop and livestock production	10.0
Link the environment and the economy the management of residual materials		
23	Support GHG emission reduction linked to the management of residual material	10.3
Take advantage of the potential of renewable energy in Québec		
24	Foster the emergence of bioenergy	50.0
25	Enhance the energy efficiency of commonly used devices	0.5
Maintain the health of individuals and communities		
26	Prevent and limit diseases, injuries, mortality and psychosocial impacts	22.3
Preserve economic prosperity		
27	Support vulnerable economic players	16.4
Strengthen the durability and safety of buildings and infrastructure		
28	Revise infrastructure design criteria and management and maintenance methods	11.5
Conserve biodiversity and the benefits that ecosystems offer		
29	Update biodiversity and ecosystem evaluation, protection and management tools	9.0
30	Update knowledge and adapt water resource management tools	15.0
	Coordination, monitoring and accountability	45.0
TOTAL		2,665.0

QUÉBEC IN ACTION GREENER BY 2020

Développement durable, Environnement et Parcs
Québec

Printed on 100% post-consumer recycled fiber paper

7347A-12-05

1196

1197

Transitioning to a Low-Carbon Economy

New Brunswick's Climate Change Action Plan

New Nouveau Brunswick

Transitioning to a Low-Carbon Economy
New Brunswick's Climate Change Action Plan

Published by:

Province of New Brunswick
P. O. Box 6000
Fredericton, NB E3B 5H1
Canada

Printed in New Brunswick

ISBN 978-1-4605-1178-7 (print edition)
ISBN 978-1-4605-1176-3 (PDF: English)
ISSN 978-1-4605-1177-0 (PDF: française)

10948

Table of contents

Premier's message . . . 1
Minister's message . . . 2
Introduction: The plan and its purpose . . . 3
Our actions . . . 4
Provincial government leadership . . . 5
Role of the provincial government in leading change . . . 5
Education and awareness . . . 6
Capacity-building . . . 6
Carbon-neutral government . . . 6
Provincial buildings GHG emissions . . . 7
Provincial transportation GHG emissions . . . 7
Low-carbon procurement . . . 8
Inter-jurisdictional partnerships and collaboration . . . 8
Collaboration with First Nation communities . . . 9
GHG emissions reductions . . . 9
GHG emission reduction targets . . . 10
Cross-sector action – A price on carbon . . . 10
Clean energy and efficiency programs . . . 11
Renewable and low-emission energy . . . 12
Reduced GHG emissions from transportation . . . 12
Regulation of industry emissions . . . 13
Reduced GHG emissions from waste . . . 13
Reduced emissions from agriculture . . . 14
Carbon sinks and offsets . . . 14
Planning for smart, low-carbon development . . . 15
Adaptation to the impacts of climate change . . . 15
Understand climate change impacts . . . 16
Build climate-resilient infrastructure . . . 16
Support community adaptation planning . . . 17
Adapt natural resources and agriculture . . . 17
Reduce climate-related hazards . . . 18
Reduce climate change impacts on public health . . . 19
Economic opportunities . . . 19
Accountability and reporting . . . 20
Funding for climate change . . . 21
Going forward . . . 21

Premier's message

Your government is listening and understands what matters to New Brunswickers.

We know New Brunswickers want their government to make investments that will help the economy and improve their quality of life. We want to create jobs and support economic growth in a responsible and sustainable manner, all the while making New Brunswick the best place to raise a family. We are working hard on these priorities and, with your support, we are getting things done.

Climate change is the most important issue to face humankind in modern times. New Brunswick must do its part to combat climate change. New Brunswick must enhance its ***Transitioning to a Low-carbon Economy***.

We must do this in a way that respects New Brunswick's economy, challenges and opportunities. That is why we established the Select Committee on Climate Change. The all-party committee of the Legislative Assembly of New Brunswick was appointed in April 2016. It was tasked with consulting New Brunswickers on climate change and reporting to the Legislative Assembly with recommendations.

Through the work of the committee, we heard that climate change is a very important issue for New Brunswickers and that our success in combating climate change will depend on the collaborative and coordinated action of all New Brunswickers.

We learned that responses to climate change in the areas of emission reduction and climate change adaptation offer the potential for long-term job creation in the province and can provide a stimulus for investment in innovation and business development. We need to be ready to take advantage of these opportunities in New Brunswick.

We also heard that people are looking for strong leadership from the provincial government to drive our response to climate change.

This plan recognizes these new opportunities for our province and all New Brunswickers are encouraged to get involved by making good energy choices, reducing waste and investing in home and business renewal.

These objectives are supported in this new stronger climate change action plan. Markets are changing as governments commit to the shift to lower carbon economies and embrace innovation and new opportunities in combatting climate change.

Brian Gallant

Minister's message

Sustainable growth involves long-term planning and innovation. A key component of sustainable growth is a strategy to address climate change. I am pleased to present *Transitioning to a Low-Carbon Economy New Brunswick's Climate Change Action Plan,* which outlines our new commitments to greater action in confronting climate change.

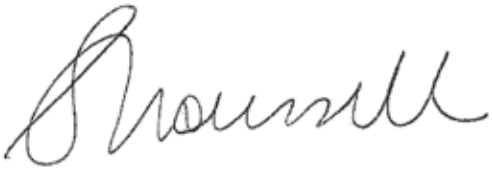
New Brunswick's emissions are projected to increase during the next 15 years. A strategic, integrated approach to emission reductions is required to address the growing climate threat.

Addressing a challenge of this magnitude is complex and may appear very challenging. But, broad action by all New Brunswickers, businesses and governments can make a major difference.

Significant change is occurring around the world and in Canada. New Brunswick must keep pace with the shift in markets to lower carbon economies to remain competitive. The province must also act early on adapting to the climate impacts we are already experiencing and those projected to occur.

This new action plan provides a roadmap of concrete actions to achieve our vision of reducing GHG emissions with continued economic growth and increasing the resilience of New Brunswick to climate change through adaptation.

The effects of climate change in our country and our province are already evident. It has become increasingly clear that the cost of inaction is greater than the cost of action, particularly early action. New Brunswick must and will rise to the challenge. *Transitioning to a Low-Carbon Economy New Brunswick's Climate Change Action Plan: A Sustainable and Green Growth Economy for New Brunswick* represents a large step forward in our efforts to combat the growing threat of climate change. It is ambitious but necessary. The time for action is now.



Honourable Serge Rousselle, Q.C.
Minister of Environment and Local Government

Introduction: The plan and its purpose

The science of climate change is clear. The Intergovernmental Panel on Climate Change, the world's foremost authority on climate change, has projected that an increase in global temperatures of more than 2 degrees Celsius will result in irreversible and catastrophic impacts. The current level of greenhouse gas (GHG) emissions is expected to raise global temperatures by 3.5 ºC before the end of this century.

Projections indicate that the effects on climate in Canada will be greater than the rest of the world. Temperatures are expected to rise two times faster than the global average. In northern Canada, this rise is expected to be three times faster.

This trend is already evident in New Brunswick. We are seeing temperatures going up, precipitation increasing and sea levels rising. The province can expect an elevated risk of heat-related health concerns; new pests and invasive species; flood damage; impacts from extreme winds; and icing of trees and power lines. Rising sea levels have also increased the risk of flooding and coastal erosion.

Under the *Paris Agreement on Climate Change*, Canada and 194 other countries agreed to keep the rise in the global average temperature below two degrees Celsius in this century. To date, 110 countries have ratified the agreement, which came into force on Nov. 4, 2016. This historic United Nations agreement signals the commitment of countries to adjust their policies and budgets to foster lower-carbon economies. This increased certainty in direction is expected to encourage major private- and public-sector investments in new technologies and approaches that will improve much of how we do things today.

Canada is making its contribution with ambitious GHG reduction targets, advances in adapting to the impacts of climate change, and contributions to climate change action in developing countries. First Ministers launched under the *Vancouver Declaration* a nationwide process with the objective of developing a pan-Canadian framework on clean growth and climate change, which will solidify collaboration between provinces, territories and the federal government on meeting international and domestic commitments.

This transition includes many opportunities for New Brunswick to be more efficient and competitive, to open new business opportunities and to build more resilience into our aging infrastructures.

Our actions

The *New Brunswick Climate Change Action Plan* outlines a bold vision for our province, by intensifying our efforts to combat climate change.

Reducing GHG emissions is vital to limiting future global temperature increases and related climate change. Adapting to climate change is also necessary because a portion of the GHGs already released into the atmosphere will remain there for many years. Current trends in climate change will continue even with a decline in emissions. New Brunswick's response to climate change must therefore address both GHG emission reduction (mitigation) and preparation for inevitable climate change (adaptation).

This action plan signals New Brunswick's intention to play its part in achieving regional GHG emission reduction targets by adopting targets that reflect total outputs of 10.7 Mt by 2030[1] and 5 Mt by 2050[2], recognizing the unique challenges of New Brunswick's economy. The provincial government confirms its previous target of 14.8 Mt for 2020[3].

This plan will also address numerous other commitments respecting climate change, including the 2015 *Paris Agreement* under the United Nations *Framework Convention on Climate Change*, the 2015 *Canadian Energy Strategy* released by the Council of the Federation, the 2016 *Vancouver Declaration on Clean Growth and Climate Change*, and the 2016 Pan-Canadian Framework.

This plan contains a climate change adaptation strategy supported by actions to build resilience into our communities, businesses, infrastructures and natural resources. Acting early and adapting to our changing climate is far more effective and cost-effective than dealing with climate impacts after they have occurred.

Highlights of the plan include:

- Providing the government leadership needed through over 100 clear action items to support sustained and ambitious actions on climate change.
- Expanding energy efficiency and clean energy programs across all sectors and all fuels with ambitious performance targets.
- Phasing out coal as a source of electricity as quickly as possible, respecting New Brunswick's economic reality.
- Planning for and investing in new technologies that reduce pollution, such as smart grid and renewable electricity.
- Establishing a made-in-New Brunswick price on carbon and caps on GHG emissions that reflect the reality of the New Brunswick's economy and will provide opportunities to invest in emission reduction measures that will create jobs for New Brunswickers, such as through energy efficiency.
- Leading by example by making government carbon-neutral by 2030 and increasing spending on energy efficiency in the capital budget by 50%.
- Measuring and reporting progress with strong oversight by committees of cabinet and the legislative assembly.

It is important to emphasize that initiatives aimed at combatting climate change also offer potential for sustainable economic development and long-term job creation in the province. It has been found to be a stimulus for investment in innovation and business development. Energy efficiency investments, for example, reduce imports of fossil fuels and improve affordability of energy for families and competitiveness for businesses by lowering energy bills. These investments also create a substantial number of local jobs. Similarly, renewable energy is sourced in our province, has low or no emissions, and is resistant to price volatility of fossil fuels. The Province will continue to work with the federal government to explore opportunities for federal funding to support the actions identified in the plan.

This plan provides a clear path forward to reducing GHG emissions while promoting economic growth and enhancing current efforts to adapt to the effects of climate change.

1 Equivalent to 35 per cent below 1990 emissions
2 Equivalent to 80 per cent below 2001 emissions
3 Equivalent to 10 per cent below 1990 emissions

Transitioning to a Low-Carbon Economy - New Brunswick's Climate Change Action Plan

This plan focuses on seven areas:

- Provincial government leadership.
- Collaboration with First Nations.
- GHG emission reductions.
- Adaptation to the impacts of climate change.
- Economic opportunities.
- Accountability and reporting.
- Funding for climate change.

Provincial government leadership

The response to climate change is a shared responsibility involving all New Brunswickers. There is a role and a place for everyone as New Brunswick addresses the challenges ahead. The role of the provincial government is critically important. It must provide the leadership and model the behaviour and actions needed to ensure sustained and ambitious actions to address the challenges and opportunities presented by climate change.

Role of the provincial government in leading change

The provincial government must take a strong leadership role in addressing the challenges and opportunities presented by a changing climate. To be successful in addressing climate change, the provincial government must provide the governance structure and support necessary to succeed and ensure the proper accountability for the implementation of New Brunswick's climate actions.

The provincial government will:

1 - ***Establish a committee of Cabinet dedicated solely to the issue of climate change, chaired by the Premier, to oversee the implementation of the action plan.***

2 - ***Introduce a*** **Climate Change Act** ***to declare New Brunswick's commitment to addressing climate change mitigation and adaptation; to provide the authority to implement a carbon pricing mechanism; to establish a climate change fund with authority to spend proceeds; to establish industrial emissions limits; and to provide transparency and accountability.***

3 - ***Require climate change, both GHG emissions and climate change adaptation, to be considered during the development of all Memorandums to the Executive Council (MECs).***

4 - ***Include in the mandate letters to all Ministers and Crown corporations the requirements to:***

  a - ***consider climate change in all decision-making; and***

  b - ***assume responsibility, as appropriate, for GHG reduction and climate change adaptation for specific economic sectors related to the department or corporation.***

5 - ***Lead by example on climate change through actions and decisions by developing the most effective and efficient tools (policy, legislation, incentives, disincentives, financing) to address climate change.***

6 - ***Ensure the Climate Change Secretariat has the power, authority and resources to:***

  a - ***coordinate, measure and report on GHG emissions reductions, adaptation achievements and implementation progress directly to the Cabinet committee, in cooperation with government departments and Crown corporations;***

  b - ***establish a multi-stakeholder climate advisory council as part of a new robust engagement model;***

  c - ***manage the continued engagement with provincial partners including municipalities, First Nations, academia, the private sector and NGOs as well as federal, provincial, territorial and international jurisdictions on climate change matters;***

d - *coordinate the gathering and dissemination of information relating to climate change*;

e - *facilitate innovation and research, and demonstrate what is possible through best practices related to climate change; and*

f - *lead the development of public awareness and education programs on climate change*.

Education and awareness

Reducing GHG emissions and adapting to the impacts of climate change require the engagement of all New Brunswickers, businesses, organizations and governments at all levels. The battle against climate change will be most successful with a clear understanding by all New Brunswickers of the serious nature of the issues and an awareness of what they can do to contribute.

The provincial government will:

7 - ***Develop a bold and comprehensive communications strategy to educate New Brunswickers about the causes of climate change, including the linkages between human activity and climate change, and identify opportunities for all New Brunswickers to participate in solutions. The approach should include partners to enable similar efforts and messages to be delivered outside of government.***

8 - ***Develop a central repository for different types of climate information. The information should be easy to access, understand and interpret. An outreach approach will be developed to ensure that partners are aware of the information and its value.***

9 - ***Incorporate climate change into education at all levels, including experiential learning and connecting learners with climate change initiatives in their local communities.***

Capacity-building

Capacity-building refers to growing the strengths, skills, knowledge, competencies, and abilities of New Brunswickers to respond to climate change. Capacity, including human, knowledge and financial, is a key component to being able to respond to the opportunities and challenges posed by climate change.

New Brunswick has a long-established and effective NGO network that works to make linkages and create partnerships among stakeholders. This effort has resulted in the creation of capacity in communities and linkages with academic institutions, researchers and planning bodies such as the regional service commissions.

The provincial government will:

10 - ***Support and strategically invest in research at New Brunswick universities and colleges.***

11 - ***Invest in training of workers, particularly in the trades, to create a new workforce oriented to energy efficiency, energy management and non-emitting energy.***

12 - ***Strengthen linkages between government, researchers, NGOs, local communities and First Nations, to create partnerships and increase local capacity.***

Carbon-neutral government

The provincial government owns and operates about 1,000 buildings and 4,500 vehicles. These assets produce around 400,000 tonnes of GHG emissions annually, with energy costs of $85 million each year. As a significant consumer of energy, the provincial government is committed to leading by example by adopting ambitious measures to reduce emissions from its facilities, fleets and other assets, as well as by using procurement to drive market demand for low-carbon goods and services.

A carbon-neutral government policy, a commitment to having no net impact on emissions, is one example of a tool that can be used to enable this type of change. British Columbia's *Carbon Neutral Government Regulation*, for example, has achieved net-zero emissions in its operations since 2010. The regulation covers the entire public sector,

including government offices, schools, colleges and hospitals. After all energy efficiency and cleaner fuel options are implemented, achieving carbon neutrality in the New Brunswick government will require an investment in emissions reduction projects to offset any remaining emissions from others who reduce or prevent GHG emissions. An offset program will help to fund more GHG reduction projects around the province and engage a broader range of participants that contribute to achieving the province's goals.

The provincial government will:

13 - ***Be carbon-neutral in its operations, facilities and vehicles by 2030.***

14 - ***Set up a GHG Offset program to facilitate achievement of its carbon-neutral goal.***

15 - ***Encourage municipal and other public institutions to participate and make similar commitments as the provincial government.***

Provincial buildings GHG emissions

The provincial government's Green Building Policy sets high environmental standards for the construction and refurbishment of all buildings that receive public funding. Energy audits have been completed in schools, hospitals and provincial parks across New Brunswick. Up to 50 public buildings are being considered for conversion to cleaner energy sources. Biomass and natural gas energy systems have already been installed in numerous public buildings.

The provincial government will:

16 - ***Strengthen its Green Building Policy to include higher performance standards regarding energy, the environment and health for design and construction of new government-owned and -funded buildings. This should serve as an example for other levels of government and the private sector.***

17 - ***Improve the energy performance of all existing government-owned buildings, including offices, schools, hospitals and affordable housing.***

18 - ***In urban areas, and where possible elsewhere, preferentially locate public buildings in areas accessible by public transit, walking and cycling.***

19 - ***Phase out the use of fuel oil for heating publicly funded buildings and replace it with low-carbon fuels such as wood pellets, natural gas, biomass and solar energy.***

20 - ***Require energy performance identification (benchmarking and labelling) for all publicly funded new construction and major building renovations.***

21 - ***Increase the use of structural and appearance wood products in construction, based on a favourable lifecycle evaluation, for all publicly funded new building construction and major renovations.***

Provincial transportation GHG emissions

While the provincial government's Green Vehicle Policy contains a commitment to stringent emission standards when replacing certain vehicles and supports the purchase of fuel efficient vehicles, there is a need for a more comprehensive provincial green transportation policy that includes specific commitments and targets to reduce vehicle emissions, support alternative transportation and reduce the demand for travel.

The provincial government will:

22 - ***Prepare a green transportation policy that will include measures to:***

a - ***develop a government electric vehicle program relating to fleet vehicles and recharging infrastructure;***

b - ***implement new fleet procurement, consistent with the Green Procurement Policy, and management systems including alternative fuel vehicles that improve fuel efficiency and lower GHG emissions; and***

c - *promote a culture of minimized travel by public servants, through measures such as enhanced teleconference capabilities in government offices, alternative work arrangements, a strengthened employee travel policy and encouragement of alternative methods of commuting to work.*

Low-carbon procurement

Green and low-carbon procurement policies can achieve better value for money by fully understanding the environmental costs associated with the production, purchase, use and disposal of goods and services. The provincial government has already implemented a number of green procurement practices and is purchasing an increasing range of green products and services.

The provincial government will:

23 - ***Prepare a green procurement policy, with a phased implementation strategy, to procure products with the lowest carbon footprint. The policy should also minimize the impact on the environment and reduce climate-related risks while still meeting the government's cost and quality requirements and respecting trade agreements.***

Inter-jurisdictional partnerships and collaboration

Collaboration with partners continues to be an important cornerstone for successfully addressing climate change, and this is particularly important for a small province such as New Brunswick.

Examples include several inter-provincial and international collaborative arrangements such as the New England Governors and Eastern Canadian Premiers (NEG-ECP) regional action plans; the Atlantic Climate Adaptation Solutions Association (ACASA), a partnership between the Atlantic provinces; and the Gulf of Maine Council's Climate Network.

Sharing information and experiences related to climate change adaptation and GHG reduction allows New Brunswick to leverage its contributions to achieve greater results as a collective than any individual province could achieve on its own. Most climate change issues include common concerns and interests amongst jurisdictions.

Also, within New Brunswick, a wide range of collaborations are proving to be highly effective in achieving climate change objectives. Valuable partnerships with local governments, businesses, academia and non-profit organizations can continue to expand opportunities such as climate change adaptation and smart growth community planning, resulting in energy-efficient, low-carbon and climate resilient communities.

The provincial government will:

24 - ***Continue to engage actively with neighbouring jurisdictions through the NEG-ECP and Gulf of Maine Council in climate change plans and initiatives.***

25 - ***Engage with municipalities and regional service commissions to encourage actions at the community planning and local development stages that include strategies for climate change mitigation and adaptation, smart growth and brownfield and infill development.***

26 - ***Collaborate closely with the federal government in priority areas such as climate change monitoring and research, GHG regulations, access to export markets for New Brunswick's low-carbon products and technologies, and other areas of shared concern.***

27 - ***Continue to collaborate closely with other Atlantic provinces under the Atlantic Climate Adaptation Solutions Association (ACASA) to share information and leverage funding opportunities related to climate change adaptation.***

28 - ***Continue to participate and maintain relationships with national adaptation working groups such as Natural Resources Canada's Adaptation Platform.***

29 - ***Continue to work collaboratively with industry and professional organizations to share information and best practices and facilitate the dissemination of climate change awareness programs.***

Collaboration with First Nation communities

Climate change will impact the natural environment upon which First Nations communities depend. There will be changes to wildlife and plant species, traditional medicines, and waterways. This will impact the culture and way of life for many First Nations communities. First Nations communities are also among the most vulnerable to climate change due to their proximity to coastal and inland waterways. New Brunswick will work with First Nation communities to help address the challenges.

First Nation communities will benefit from the economic opportunities presented by transitioning to a low-carbon economy. Reducing GHG emissions presents opportunities for job creation and economic development across the province, as well as opportunities to enhance the efficiency and sustainability of energy use in First Nation communities.

The ideas included in this section are potential areas of collaboration with First Nations. They are a starting point, setting out New Brunswick's commitment to an ongoing dialogue and long-term engagement.

The provincial government will:

30 - ***Continue to engage with First Nations to support implementation of this action plan, including*:**

- a - ***developing working groups with First Nations representatives to address priority actions***;
- b - ***including First Nations representation on a climate change advisory committee***;
- c - ***sharing climate impact information and tools to help identify and address vulnerabilities***;
- d - ***supporting capacity building opportunities to grow the strengths, skills, knowledge, competencies, and abilities of First Nations communities to respond to climate change; and***
- e - ***supporting programs to improve the energy efficiency of homes and businesses***.

GHG emissions reductions

New Brunswick's emissions are projected to increase gradually during the next 15 years. A new, integrated approach to GHG emission reduction is required for New Brunswick to meet our climate responsibilities and maintain economic competitiveness.

New Brunswick has a small population with an economy dominated by energy-intensive and export-oriented industry. It is important that economic investments be made in reducing energy waste and making cleaner energy choices. Transitioning to a low-carbon economy is no longer just a climate issue; it is increasingly about access to export markets and being competitive in attracting new investment. New Brunswick must also be aware of the circumstances regarding our primary export destinations in the northeastern United States and new markets in Europe and other parts of the world. The federal government has joined about 40 nations and many states and regions in having implemented or committed to putting a price on carbon emissions. There is a risk that carbon-intensive New Brunswick products may be subject to market or regulatory challenges in destination jurisdictions and erode our competitiveness. We must be mindful of this risk.

This action plan supports two objectives: reducing GHG gas emissions and maintaining economic growth.

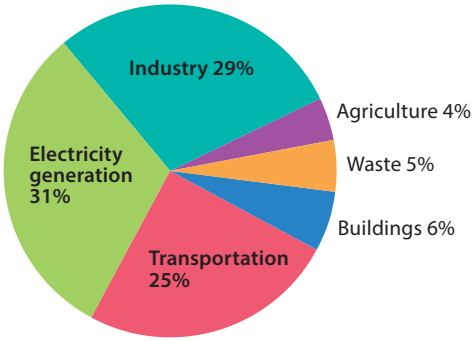


Figure 1: Distribution of GHG emissions in New Brunswick
Source: Environment Canada

Figure 1 illustrates the distribution of GHG emissions among the various sectors in New Brunswick. Electricity generation, industry and transportation are the three dominant contributors to provincial GHG emissions.

In developing this action plan, the provincial government carried out a review and analysis of a wide range of options to reduce GHG emissions. Consultations across government, stakeholders and other provinces were conducted and recommendations from the Select Committee on Climate Change were considered. An extensive analysis of options helped to evaluate the potential GHG emission reductions.

The analysis of options was used to identify several high-level policy and program initiatives for inclusion in this action plan. These initiatives include a price on carbon emissions, clean energy and efficiency programs, renewable energy programs, reduced emissions in transportation, regulation of industry GHG emissions, reducing agricultural emissions, waste, planning for smart, low-carbon development as well as carbon sinks and offsets.

The selected initiatives have been chosen from among the best approaches that are effective in reducing GHGs while protecting and growing the economy. Further, while any single initiative can stand alone, the effectiveness of each one is increased by adoption of the full slate of initiatives due to their inter-dependent nature. For example, establishing a price on carbon emissions helps with shifting investment to lower emissions activities and also funding programs supporting energy efficiency to reduce costly waste. These actions are the best and lowest-cost options to help phase out fossil fuels in the longer term.

GHG emission reduction targets

Although New Brunswick's GHG emissions have declined in recent years, they are not projected to decline in the future under the status quo. This, along with increasingly stringent GHG reduction targets adopted by NEG-ECP and the provincial government, means that additional GHG emission reduction measures will be required.

The provincial government will:

31 - ***Establish specific GHG emission targets for 2020, 2030 and 2050 that reflect a total output of:***

- a - ***14.8 Mt by 2020;***
- b - ***10.7 Mt by 2030; and***
- c - ***5 Mt by 2050.***

Cross-sector action – A price on carbon

It is now clear that strong action on climate change includes the commitment to establish a pricing mechanism for GHG emissions (a price on carbon). In October 2016, the federal government announced its intention to establish a price on carbon emissions of $10 per tonne in 2018, rising to $50 per tonne by 2022. Provinces and territories will have a choice in how they implement this pricing. Should any province or territory not establish a price on carbon by 2018, the federal government will implement a price in that jurisdiction.

When Ontario implements its cap-and-trade program, 85 per cent of Canadians will be paying a price on carbon. All of the northeastern United States already have a price on carbon emissions. This measure will stimulate investment in GHG emission reductions but is insufficient on its own to meet emissions reduction targets. That is why, in addition to carbon pricing, programs that provide advice and incentives for energy saving and clean energy are needed. Revenue generated from carbon pricing will be used to help support these new and expanded programs in the future.

The provincial government will:

32 - ***Implement a made-in-New Brunswick carbon pricing mechanism that addresses the requirements of the federal government for implementing a price on carbon emissions by 2018 and at the same time recognizes New Brunswick's unique economic and social circumstances. The provincial government will take into consideration impacts on low-income families, trade-exposed and energy-intensive industries, and consumers and businesses, when developing the specific mechanisms and implementation details, including how to reinvest proceeds. Any carbon pricing policy will strive to maintain competitiveness and minimize carbon leakage (i.e., investments moving to other jurisdictions). Proceeds from carbon emissions pricing will be directed to a dedicated climate change fund.***

Clean energy and efficiency programs

As 92 per cent of emissions in New Brunswick are from energy use, there are essentially two dominant ways to reduce GHG emissions: reducing energy consumption and switching to cleaner fuels. There are initiatives, currently being implemented in leading jurisdictions, which achieve this while increasing investments in their local economies and creating jobs. Studies and experience show positive economic outcomes related to this approach.

The potential for energy efficiency in homes, businesses and transportation in New Brunswick is substantial. Leading jurisdictions are achieving efficiency gains by reducing energy waste by 1.5 per cent to 1.75 per cent per year through energy efficiency programs. This crosses all fuels and all sectors. In electricity alone, which is about 30 per cent of energy use in New Brunswick, the energy efficiency potential in electricity has been estimated by NB Power to be equivalent to more than 600 MW. A broader and more aggressive suite of energy efficiency and clean energy programs will reduce reliance on fossil fuelled electricity generation.

Energy we do not use is free of cost and emissions. Through eliminating waste of energy through efficiency measures, we can significantly reduce demand. Investments made within the province in energy efficiency are an attractive alternative to buying imported energy. The provincial government recognizes the significant untapped potential to improve New Brunswick's energy efficiency, thereby reducing GHG emissions and energy costs.

The provincial government will:

33 - ***Mandate energy efficiency delivery agents to provide energy efficiency initiatives with:***

- a - ***clear performance-based targets for program-delivery services, in line with potential for efficiency gains in New Brunswick and performance levels in leading jurisdictions; i.e., in the range of 1.5 per cent to 1.75 per cent of sales per year;***
- b - ***sustained funding, including financial incentives and financing mechanisms, to support enhanced progressive long-term programs;***
- c - ***expanded capacity and programs to support low-income New Brunswickers;***
- d - ***active promotion and recruitment of participants to enhance program uptake;***
- e - ***training for building contractors through partnerships with the New Brunswick Home Builders' Association and other stakeholders;***
- f - ***coverage of all sectors (i.e., transportation, industry, commercial, residential) and all fuels;***
- g - ***the scope to include distributed clean energy options such as solar, wind and bio-energy;***
- h - ***performance auditing and reporting periodically; and***
- i - ***legislative and regulatory authority to enable energy efficiency delivery agents to meet the above conditions.***

34 - ***Increase spending on energy efficiency in the capital budget by 50%.***

35 - ***If viable, use the Property-Assessed Clean Energy (PACE) Program in New Brunswick as a means of financing for private property owners to implement energy efficiency and renewable energy improvements.***

36 - *Urge the federal government to*:

a - *improve energy efficiency through revisions to the building standards for First Nations housing; and*

b - *agree to add energy efficiency as a component of social housing agreements.*

37 - *Continue to encourage innovation such as smart grid technologies to facilitate additional efficiency gains in electricity service in the mid to long-term*.

38 - *Within a time frame that respects New Brunswick's circumstances and takes into account training in the building industry to ensure adequate compliance, adopt the latest* **National Energy Code of Canada for Buildings** *and* **National Building Code.**

39 - *If viable, require energy labelling for all new building construction, both residential and commercial*.

Renewable and low-emission energy

New Brunswick is endowed with a wealth of renewable energy sources (hydro, biomass, wind and solar), which offer an array of local benefits for sustainable economic development, including lower GHG emissions. For example, the use of domestic wood-based biomass, such as wood pellets, offers economic development opportunities and provides an affordable low-emission alternative to oil and electric heating.

Much of the province's electricity already comes from renewable or emissions-free sources. The 2011 energy policy increased the commitment of the provincial government by setting a target of meeting 75 per cent of electricity demand with renewable or emissions-free sources by 2020.

The provincial government will:

40 - *Work with the federal government, our neighbouring provinces, local stakeholders and the electric utility toward eliminating coal-fueled electricity generation as quickly as possible. If adequate support can be found to minimize impacts on energy costs and the local economy, eliminate coal by 2030. Alternatively, phase out coal by the status quo date of 2040 with interim emission reductions aligned with new federal regulations.*

41 - *GHG emissions from electricity generation in the province will be regulated in alignment with provincial emissions targets*.

42 - *Support the uptake of increased renewables for both electricity generation and residential/business heating in New Brunswick, through financial incentives, policy and legislation*.

43 - *Investigate and remove existing barriers to achieving greater implementation of renewable power generation, distributed energy generation, and net metering*.

44 - *Review the outcomes of the small-scale community renewable energy program upon completion and expand or modify the program accordingly*.

45 - *Work with the federal government to address the barriers to using registered retirement savings plan investments to support community economic development corporations with their renewable energy projects*.

Reduced GHG emissions from transportation

Transportation contributes about 30 per cent of all GHG emissions in the province. To reduce these emissions, initiatives are needed in three areas:

- vehicle choices;
- vehicle fuels; and
- transportation modes (road, rail, marine and pipelines).

The availability and popularity of electric vehicles and hybrids are growing rapidly. They produce lower GHG emissions and air pollution than traditional internal combustion engines. As the province's electricity is increasingly sourced from low-emission or non-emitting sources, the environmental benefits of switching to electric vehicles can be significant.

Emissions from freight movement can also be improved through the use of alternative fuels, aerodynamic treatment to trucks and engine design advancements. Shifting the mode of transportation can reduce energy use and emissions such as shifting from rail to pipelines. Better access to clean alternative transportation such as public transit, ride-sharing and bicycling reduces transportation emissions, offers affordable options and demonstrates improvements in community design.

The provincial government will:

46 - ***Work to have 2,500 electric vehicles[4] on the road in New Brunswick by 2020 and 20,000 by 2030.***

47 - ***Implement an electric vehicle strategy that specifies the required incentives, regulations, policies, programs and charging infrastructure to achieve the above-mentioned targets for electric vehicles.***

48 - ***Work with industry, shippers and other stakeholders to identify opportunities and partnerships to facilitate multi-modal transportation (road, rail, marine and pipelines) aimed at improving efficiencies (e.g., logistics) and reducing GHG emissions.***

49 - ***Work with freight trucking partners to improve the fuel efficiency of freight trucks by installing proven fuel-saving devices such as aerodynamic features and new engine technologies while addressing regulatory barriers to implementation; piloting the use of alternative fuels such as natural gas will also be considered.***

50 - ***Collaborate with municipal and local governments to expand cleaner alternative transportation options such as electric vehicles, public transit, carpooling, ride-sharing, bicycling and walking.***

51 - ***Advance public transportation planning at the regional level to allow for route integration and improvements in access.***

Regulation of industry emissions

The provincial government is already implementing a regulated requirement for large industry to report its GHG emissions and to submit GHG management plans. The next step is to set emission limits for large industry and to require medium-sized industries to begin reporting and managing their emissions.

The provincial government will:

52 - ***Extend the reporting requirements to facilities that emit at least 10,000 tonnes of GHG emissions per year and management requirements to facilities that emit at least 25,000 tonnes of GHG emissions per year, by the end of 2017, respectively, and work with industry to ensure a smooth transition.***

53 - ***Set emissions limits on the largest industrial emitters in consultation with relevant stakeholders, the federal government and other provinces to ensure that the measures are effective in reducing GHG emissions and are fair and equitable.***

54 - ***Extend the requirement of Greenhouse Gas Management Plans for Industrial Emitters in New Brunswick (2015) to include the preparation of an energy management plan, in keeping with the Operating Approval condition, pursuant to the Air Quality Regulation of the* Clean Air Act.**

Reduced GHG emissions from waste

GHG emissions from the waste management sector in New Brunswick represent about five per cent of the province's total GHG emissions. There are three basic ways to reduce emissions from waste:

- waste prevention (such as packaging and food waste);
- diversion of organics and recyclable material from landfills;
- capture and reuse emissions from waste such as landfill gas.

4 Electric vehicles include plug-in electric passenger, fleet (such as taxies) and commercial (such as delivery) vehicles.

These measures could have significant impacts across multiple sectors, both within and outside New Brunswick, at relatively low costs, as they would reduce demand for raw materials, emissions from transporting and processing these inputs, as well as emissions from landfills. While all six of New Brunswick's active regional landfills are either equipped with landfill gas management systems or are in the process of having them installed, there remain additional opportunities for GHG emission reductions in the form of waste prevention and the diversion of organics and recyclable materials from landfills.

The provincial government will:

55 - ***Require all regional service commissions to increase the diversion of organic waste and recyclable materials from disposal.***

56 - ***Support further improvements in regional solid waste landfill gas capture.***

Reduced emissions from agriculture

The agriculture sector is an essential part of New Brunswick's economy and creates four per cent of its annual GHG emissions. Farmers are currently increasing their environmental awareness, including the subject of climate change, through their voluntary involvement in the Environmental Farm Plan (EFP). The EFP addresses things such as energy efficiency, management of livestock facilities, manure storage and handling, pasture management, soil management and nutrient management. Upcoming revisions to the EFP are expected to include an increased focus on climate change mitigation and adaptation. Reasonable steps can be taken to help farmers mitigate the impact of their operations through beneficial farm management practices. Many of these Best Management Practices have a side benefit, not necessarily known to the farmer, of reducing GHG emissions. For example, implementation of a nutrient management plan and installation of subsurface drainage will both reduce nitrous oxide emissions and good genetic selection to improve feed efficiency will help to reduce methane production from beef cattle. By looking at opportunities at the farm level, farmers will be able to improve efficiencies and reduce their impacts on the environment.

The provincial government will:

57 - ***Work with the federal government to promote the adoption of beneficial farm management practices that mitigate GHGs, including program funding and incentives where appropriate.***

Carbon sinks and offsets

A carbon sink is anything that absorbs more carbon than it releases and can be a natural or artificial system. Increasing carbon sinks can be an important method of mitigating climate change by keeping some GHGs out of the atmosphere and offsetting emission reductions elsewhere. Land-use management decisions applied to forests and agricultural land can increase carbon storage by implementing measures such as conservation tillage, conversion of marginal agricultural lands back to forests, forest restoration and urban forestry.

There are two types of markets for carbon offsets: voluntary markets and regulated markets. In voluntary markets, specific protocols are generally less stringent on how the forest is managed or how the offsets are administered over time as compared to regulated markets. Regulated carbon markets are ones where more detailed and stringent protocols are in place to dictate how forests are required to be managed. Offsets sold into a regulated market tend to receive a higher price than voluntary offsets. Having a cap and trade system is not a requirement for selling carbon offsets.

The provincial government will:

58 - ***Continue to encourage opportunities for increasing forest and agricultural carbon sinks, as part of the development and promotion of sustainable forest programs and beneficial management practices in agriculture.***

59 - ***Encourage the expansion, restoration, preservation and management of green buffers and urban forests.***

60 - ***Explore the opportunity for participation in carbon offset markets (voluntary and regulated) as a means to capture GHG emissions and economic opportunities for New Brunswickers, in accordance with accepted offset project design, measurement and verification protocols.***

61 - ***Encourage the use of wood products (a renewable construction material that sequesters carbon for the long-term) in construction, including through building codes, standards and procurement policies.***

Planning for smart, low-carbon development

Land-use planning can support the transition to a low-carbon economy by reducing GHG emissions in communities through smart growth oriented development patterns, and through tree plantings, green roofs and permeable surfaces. Urban form and spatial planning measures can also largely drive transportation emissions reductions and may also facilitate improvements to new building efficiency by driving more compact design. How we design our communities can also have a large impact on public health by promoting healthy built environments, healthy lifestyles and sustainable communities.

The provincial government will:

62 - ***Encourage community and regional land-use planning practices that incorporate energy efficiency, energy conservation, carbon sequestration, reduced emissions, support healthy built environments and which incorporate and encourage communities to improve the availability and accessibility of safe alternative forms of transportation such as walking, cycling and public transit.***

63 - ***Provide incentives to promote smart growth (natural infrastructure, green buildings, low-impact developments) and sustainable community design.***

64 - ***Incorporate GHG emission reduction considerations into lifecycle assessments of infrastructure projects.***

65 - ***Include in the upcoming modernization to the* Community Planning Act *and* Municipalities Act, *the ability to respond to the needs of local governments and their priorities for mitigation.***

Adaptation to the impacts of climate change

GHG emissions remain in the atmosphere for many years. As a result, the trends in climate change can be expected to continue even with a targeted decline in GHG emissions. Early adaptation to climate change impacts is critical in avoiding much higher costs related to human health and safety, damage to communities and infrastructures and changes in natural resources.

Climate resilience is the ability to survive and flourish in the face of a changing climate. Climate change adaptation is a key means to achieving climate resilience, and is about making informed forward-looking decisions considering future climate conditions.

Examples of adaptation:

- trimming trees to avoid damage to power lines from ice and wind storms;
- protecting or moving buildings to avoid flood damage; and
- improving drainage systems in communities to handle extreme rainfall events.

A changing climate presents both risks and opportunities for New Brunswick's communities and resource sectors. In order to reduce the risks and take advantage of the opportunities, we must fully understand the challenges posed by a changing climate and present realistic approaches to addressing them. Adaptation will help to maintain and enhance our province's economic competitiveness, the well-being of New Brunswickers and resilience of communities.

Climate risks and adaptation planning can be comprehensively incorporated into provincial decision-making; however, while the provincial government has an important role to play in building New Brunswick's resilience to climate change, many of the most important decisions will be made at the local level. Community planners, prop-

erty owners, local governments, First Nations, infrastructure owners, businesses, community and environmental groups, and resource managers all need important climate and adaptation information and tools for guidance.

Understand climate change impacts

Measuring climate change and the impacts in New Brunswick as well as projecting future trends are essential to building resilience in our communities, provincial infrastructures and managing our natural resources. Buildings, roads and bridges, power lines, communications systems and drainage systems all need to be designed and built to withstand future climate conditions. Management of forests, agricultural lands and other resources requires reliable climate information.

Critical to this is a robust system of monitoring and information gathering of reliable data. For example, it is important to understand the causes, frequency, severity and consequences of flooding due to the increasing risk of high water levels and erosion along coasts and rivers.

The provincial government will:

66 - ***Strengthen research capabilities into the impacts of climate change by identifying research priorities, developing a research network and encouraging greater collaboration and sharing of information across partners (e.g., academic institutions, other jurisdictions, federal government, NGOs).***

67 - ***Develop a more coordinated approach to tracking changes in the physical environment, (e.g., temperature, precipitation, sea levels and migration of pests and invasive species) in collaboration with other partners to be used in future climate modelling.***

68 - ***Acquire the most up-to-date predictive climate change information for all parts of the province and ensure the modelling capacity exists to support decision-making.***

69 - ***Acquire, and make available publicly, LiDAR data for mapping land elevations to be used across all sectors in planning for future climate conditions, especially for flood risk mapping and coastal erosion.***

70 - ***Support the development of analytical and educational tools to help communities, infrastructure owners (roads, power lines, etc.) and the natural resources sector identify their vulnerabilities and take action to adapt.***

Build climate-resilient infrastructure

Infrastructure plays a critical role in social, economic, and ecological well-being. It provides essential services to communities and businesses, including water, power, agriculture, hospitals and other health care facilities, schools, transportation networks, telecommunications, and protection from the elements. Climate change impacts can contribute to road, bridge, port, rail, and airport disruptions, and increased costs for infrastructure repair and maintenance. These disruptions in productivity, critical trade infrastructure, electricity generation, and supply chains would have far-reaching consequences for many economic sectors, services to consumers and businesses.

There is a strong case to be made for incorporating climate change considerations into all infrastructure decision-making. Significant dollars are spent annually on new and existing infrastructure by all governments and the private sector. Making these substantial, long-lived, investments resilient to climate change impacts saves costs in the long-term and provides opportunities for the implementation of innovative approaches. This includes consideration of different types of infrastructure (e.g., hard versus natural), as well as the design, location, operation, maintenance and decommissioning of infrastructure assets.

The provincial government will:

71 - ***Promote and use natural infrastructure (e.g., forests, wetlands, salt marshes, floodplains) as an important tool to buffer against climate change impacts.***

72 - ***Ensure that the impacts of climate change and extreme weather are considered in all infrastructure decisions and the lifecycle assessment of all infrastructure projects (design, construction, operation, and maintenance).***

73 - ***Work with the provincial infrastructure owners (e.g., Department of Transportation and Infrastructure, NB Power, Bell Aliant) to ensure that climate change adaptation plans are completed for all critical infrastructure by 2020.***

74 - ***Work with municipalities to evaluate vulnerabilities of critical infrastructures (e.g., drinking water supplies and sewage treatment systems) and ensure they are resilient to climate change impacts.***

75 - ***Develop guidelines for the consideration of climate change in infrastructure decision-making.***

Support community adaptation planning

Adaptation at the community level means embarking on a systematic review of the predicted nature and scale of impacts to the community and their resultant vulnerabilities (e.g., potential flooding of a main street blocking access to a hospital). These can then be listed and ranked in order of priority according to the level of risk they represent. Solutions can then be identified in an adaptation plan.

Various actors in New Brunswick are already engaged in community adaptation planning. These early adopters have developed nodes of expertise and their experiences can be shared with others. NGOs play a critical role in New Brunswick in helping to guide communities through the adaptation planning process. Although there has been an increase in the number of communities that are engaged in adaptation planning, there is still significant work to be done to ensure that all communities are considering the impacts of future climate conditions and developing plans to address them.

The provincial government will:

76 - ***Ensure NGOs and local community partners are supported so they can continue to guide communities through the adaptation planning process.***

77 - ***Phase-in the mandatory preparation and implementation of climate change adaptation plans for local and municipal governments that apply for provincial infrastructure funding. Provide capacity-building support to enable this action and develop guidelines to assist in the preparation of the required adaptation plans.***

78 - ***Conduct climate change adaptation planning at a regional scale and empower regional service commissions to coordinate this exercise.***

79 - ***Include in the upcoming modernization to the* Community Planning Act *and* Municipalities Act, *the ability to respond to the needs of local governments and their priorities for adaptation.***

80 - ***Implement statements of provincial interest under the* Community Planning Act *to establish province-wide standards and requirements for responding to climate change at the community level, such as flood risk reduction.***

81 - ***Collaborate with the cities to ensure that climate change vulnerability assessments and adaptation plans are completed by 2020.***

82 - ***Collaborate with the municipalities and regional service commissions to ensure that climate change vulnerability assessments and adaptation plans are completed for our highest risk municipalities by 2020.***

Adapt natural resources and agriculture

New Brunswickers rely heavily on natural resources such as trees, water, land, fish and wildlife and our agricultural resources – all of which are influenced by climate. Our economy is therefore particularly vulnerable to climate change.

There is increasing recognition of the value of natural infrastructure such as wetlands, floodplains, dunes, forested areas and natural buffers, in protecting communities and critical infrastructure in high risk areas such as along coastlines and in floodplains.

The provincial government will:

83 - ***Incorporate climate change knowledge into Crown land operating plans, silviculture planning and all forest management plans.***

84 - *Work with natural resources managers to ensure that climate change adaptation plans are completed by 2022 to address major climate threats.*

85 - *Support research into the impacts of climate change on agriculture and examine new crop and market opportunities as a result of changing growing conditions.*

86 - *Encourage future federal-provincial-territorial funding agreements to include a stronger focus on climate change.*

87 - *Take measures to advance agricultural practices that promote soil health and reduce vulnerability to soil erosion.*

88 - *Strengthen the existing program to assist with riparian buffer restoration in agricultural areas, recognizing that riparian buffers between agricultural activities and watercourses are important to address erosion and runoff from extreme weather events.*

89 - *Recognize the importance of ecosystems (e.g., wetlands, forests, soil, dunes, coastal salt marshes) in buffering the impacts of climate change, and integrate ecosystem services (e.g., temperature control, maintaining air quality, erosion control, water quality improvement, flood reduction) into land-use planning.*

90 - *While balancing the economy and the environment, identify and focus on the most climate-vulnerable species, habitats, and landscapes as targets for adaptation action and manage for landscape connectivity to allow for species migration.*

91 - *Develop guidelines for project proponents to ensure that future climate considerations are incorporated into Environmental Impact Assessment.*

92 - *Collaborate with the federal government to:*

a - *Ensure that sufficient refuge harbours and wharves exist for protection from storm events;*

b - *Adjust the timing of fishing seasons in response to changing marine conditions; and*

c - *Move more quickly to take advantage of new fisheries that may appear in New Brunswick waters.*

Reduce climate-related hazards

Climate change is contributing to extreme and catastrophic weather events throughout much of Canada, including the likelihood of flooding, wildfire, drought, heat and wind.

Hazards and disaster risks have always been a concern; however climate change is driving the need to adapt to more intense and frequent events. Traditionally, responses to disasters have been reactive, but recent experiences have shown the benefit of investing in proactive and preventative measures.

Disaster risk reduction and adaptation efforts can complement one another to buffer society from climate-related impacts and better position communities to reduce and manage disaster impacts more broadly. Additionally, land-use planning is a powerful tool in helping to reduce the impacts of natural disasters, and can inform decisions about if and where to rebuild during disaster recovery.

The provincial government will:

93 - *Ensure provincial disaster financial assistance programs and insurance products are responsive to climate change.*

94 - *Consider future climate conditions when making decisions about replacing or repairing infrastructure following disasters ("build back better" or relocate).*

95 - *Continue to promote and support opportunities to share information amongst adaptation practitioners, the general public and emergency management officials with an aim to increase our collective resilience.*

96 - *Renew and expand its flood hazard data and mapping, and ensure that these predictive tools incorporate the anticipated effects of climate change in parallel with the development of a provincial statement of interest that addresses flood risk and climate.*

97 - *Examine the relationship between watershed condition, land use and peak flow events associated with extreme precipitation.*

98 - ***Encourage the insurance industry to make flood insurance available to high-risk homeowners and promote awareness of available products.***

Reduce climate change impacts on public health

Climate change is increasing the risks to the health and well-being of New Brunswickers. These risks can be mitigated by focusing on both prevention (e.g., supporting research and building capacity and awareness to promote health and well-being and efforts to reduce risks), as well as effective responses to climate impacts (e.g., providing health care services and interventions, such as extreme heat and forest fire smoke alert warning tools). While there is already work underway, in New Brunswick it will be important to build on and expand these efforts.

The provincial government will:

99 - ***Develop a public health communication strategy and continue to work collaboratively to educate the public, and other stakeholders, on the climate change impacts on human health.***

100 - ***Support ongoing research into climate-related health risks, including drinking water quality and quantity, increased risk of heat-related incidents, psychological and physiological impacts of extreme weather events and the potential spread of vector-borne diseases.***

101 - ***Continue to implement, and support, an extreme Heat Alert and Response System (HARS) throughout New Brunswick.***

102 - ***Explore, and support in partnership with other departments, the development of health surveillance tools for morbidity, mortality and mental health stress among the public following extreme weather.***

103 - ***Explore, and support in partnership with other departments and federal agencies, municipalities, the development of new warning tools for public health hazards linked to climate change such as extreme heat, air quality, forest fire smoke, vector-borne diseases, etc.***

104 - ***Assess public health risks in drinking water quality and quantity, increased risk of heat-related incidents, psychological and physiological impacts of extreme weather events and the potential spread of vector-borne diseases.***

Economic opportunities

An integrated, economy-wide approach to create jobs and drive innovation across all sectors and regions is required to grow New Brunswick's economy, achieve our GHG emission targets and improve overall environmental performance. There are significant financial opportunities that exist through reducing energy costs and the potential for reinvesting the savings into New Brunswick's economy.

Technological innovations and advancements are critical to accelerating the transition to a low-carbon economy. Despite a growing global clean technology sector, New Brunswick faces challenges in low-carbon innovation, particularly with respect to commercialization of the technologies.

There will be opportunities for certain sectors as the climate changes and New Brunswick must prepare to take full advantage of these, specifically as they relate to the agriculture and tourism sectors. New Brunswick is leading in the adaptation field in many ways and there may be opportunities to market our tools and approaches more broadly.

The provincial government will:

105 - ***Design and implement a clean-technology acceleration strategy that builds on early-stage innovation research, development and demonstrations (RD&D); accelerates clean technology commercialization; fosters greater clean technology adoption; and enhances connections and collaboration between business market needs and research expertise to accelerate the development and use of clean, low-carbon technology solutions.***

106 - *Create the conditions for growth and job creation in the areas of clean technology, products and services related to climate change in all sectors such as housing, agriculture, forestry, manufacturing, energy efficiency, renewable energy, information technology and transportation.*

107 - *Support a culture of innovation to pursue economic opportunities presented by our changing climate such as tools and approaches to adaptation developed in New Brunswick that are marketable elsewhere.*

108 - *Work with the tourism and recreation sector to pursue new opportunities presented by our changing climate and to promote New Brunswick as a world class destination.*

109 - *Take advantage of the large financial opportunities that exist through reducing energy costs and the potential for reinvesting the savings into New Brunswick's economy.*

Accountability and reporting

Accountability through measurement, reporting and verification of progress is becoming an important element in climate change action plans and is growing in importance in international agreements on GHG emission reductions. Reporting allows the province to track success in adapting to climate change and to determine the effectiveness of GHG emission reduction initiatives.

Most measures of progress in adapting to the impacts of a changing climate tend to focus on short-term implementation measures such as the number of adaptation or vulnerability plans completed. The true measure of progress in adaptation is whether something has increased the adaptive capacity of a community or the province. The latter is more complex and a longer term objective. The provincial government will continue to report on short-term measures while over the long-term strive to develop a more complete measure of adaptive capacity.

An understanding of the province's energy consumption and GHG emissions profile is necessary to measure progress in GHG emission reductions and to assess opportunities for further reductions.

The provincial government will:

110 - *Continue to release annual progress reports on implementation of the measures identified in this action plan and in the annual work plans.*

111 - *Establish a standing committee of the legislative assembly on climate change to receive:*

- a - *annual reports on progress toward responding to climate change;*
- b - *annual reports on revenue, expenditures and performance of the climate change fund; and*
- c - *feedback from a multi-stakeholder climate advisory council on the climate fund and progress toward responding to climate change.*

112 - *Use long-range energy and economic modelling to track, project and report on GHG emissions.*

113 - *Develop and implement a government-wide energy management and reporting system by 2020 to ensure all departments are accountable for energy consumption and corresponding GHG emissions.*

114 - *Encourage the management and reporting of GHG emissions by local governments and businesses.*

115 - *Report on the number of communities with completed climate change vulnerability assessments and adaptation plans and on progress toward implementation.*

116 - *Conduct research and analysis along with academic experts and other jurisdictions to develop a means of measuring climate change adaptive capacity and reporting progress.*

Funding for climate change

Dedicated funding for climate change initiatives is essential to ensure sustained, ambitious and collaborative action to address climate change. Funding will be required to address adaptation and mitigation initiatives.

The provincial government will:

117 - ***Establish and administer a climate change fund that will*:**

- a - ***ensure proceeds from carbon pricing are invested back to consumers and economic sectors to reduce emissions (energy conservation and efficiency, and renewables) and climate change adaptation; and***
- b - ***ensure expenditures are done in accordance with government's climate action priorities;***
- c - ***consider all existing provincial and federal funds and opportunities to further leverage the climate change fund.***

118 - ***Make provisions for multi-year funding for climate-related initiatives*.**

Going forward

Our government is committed to fulfilling its moral obligations to help combat climate change, while ensuring we are positioning our province for economic growth in the short-, medium- and long-term. The select committee we appointed has listened to New Brunswickers, and having considered their advice, we are now delivering a plan for clear results.

Transitioning to a Low Carbon Economy – New Brunswick's Climate Change Action Plan is our plan to reduce emissions and build resilience by adapting to a changing climate, while at the same time growing New Brunswick's economy. It will help us transition to a strong, more diverse and competitive economy, with new jobs, technologies and exports, while also sustaining families and communities.

The Plan is a commitment that New Brunswick will do its part on climate change by way of a made-in-New Brunswick approach to meeting our own particular needs. The significant work that has been undertaken by communities, individuals and governments are reasons for optimism in the face of the challenge presented to us by climate change and the broad scope of actions required. The expanded efforts begin now and will continue over the long-term. It will take time and there will be challenges but with the participation of all New Brunswickers, we can achieve our commitments.

TAKING ACTION

A CLIMATE CHANGE ACTION PLAN FOR PRINCE EDWARD ISLAND

2018-2023

Prince Edward Island
CANADA

www.PrinceEdwardIsland.ca/climatechange

MINISTER'S MESSAGE

There is now overwhelming evidence that climate change is occurring and the consequences may be quite serious for our Island province. Our Earth's climate is warming and the 'greenhouse gases' emitted by human activities, in particular the burning of fossil fuels, is a major contributor. Every day we see the evidence in more extreme weather events, rising sea levels, and coastal flooding.

The Climate Change Action Plan provides a framework for both adapting to the new forces that are re-shaping our global environment, as well as mitigating greenhouse gas emissions. Islanders need to be prepared for the future and as we renew our efforts to protect our Island, we need to make changes to our way of life and rethink how we work, live, and play.

We have collaborated with the community as well as experts in the field to develop this Action Plan. Actions outlined in the plan provide practical solutions that will allow us to adapt to a changing climate and do our part to reduce greenhouse gas emissions. If the plan is to be successful it will require the wholehearted efforts of every individual, community, and industry group from across the province. By working together, we will be able to build a better and more secure future for Prince Edward Island.

The Honourable Richard Brown

Minister of Communities, Land and Environment

4 **Introduction**

7

Our Five-year Plan

Our five-year plan outlines the actions that government will take to both adapt to a changing climate and reduce our greenhouse gas emissions.

8 **ACTIONS**

- Adapting to Climate Change
- Reducing Greenhouse Gas Emissions
- Carbon Sequestration
- Education and Capacity Building
- Research and Knowledge Building

23 **Measuring and Reporting Success**

24 **Doing Your Part**

26 **Appendix 1 –** Climate Change Action Timeline

28 **Appendix 2** – Climate Change Policy Documents

29 **Appendix 3** – Estimated GHG Emission Reductions

30 **Appendix 4** – Energy Efficiency and Fuel Switching Programs

INTRODUCTION

Prince Edward Island's residential, commercial, and industrial infrastructure located on the coast will become increasingly vulnerable to sea level rise and storm activity.

The earth's climate is changing and there is overwhelming scientific evidence to support that much of the change is being caused by human activity. Human activities—including our use of fossil fuels to run our vehicles, heat our homes, and power our industries—release gases, called greenhouse gases (GHGs), into the atmosphere. Farm practices and waste management also generate GHGs that contribute to this problem. These GHGs are accumulating in the atmosphere like a blanket, trapping heat and raising global temperatures.

Warmer temperatures will affect all aspects of our climate, influencing everything from the amount of rain that falls to how much sea ice accumulates in the bodies of water surrounding our Island. Prince Edward Island can expect the following changes:

- *milder winters, earlier extended thaws, earlier starts to the growing season, later frosts, and more extreme hot days;*
- *more intense and frequent heavy rainfall events, changes in the timing of our rainfall, and increased demand on water resources;*
- *rising sea levels, reduced sea ice, more intense storm surges, and increased coastal erosion and flooding; and*
- *changes in the type, diversity, and distribution of plant-life, fish, and animal populations, and emergence of new pests and diseases.*

These changes will affect Prince Edward Island in different ways. For example, Prince Edward Island's residential, commercial, and industrial infrastructure located on the coast will become increasingly vulnerable to sea level rise and storm activity. Drier, warmer summers may have a positive impact on some parts of our tourism industry, while others, such as golf courses, may struggle to maintain their fairways with less rain. Farmers may begin to grow new crops, but struggle to grow ones that have been part of their rotations for many years. Softwood trees could begin to decline in favour of hardwood species suited to longer, warmer growing seasons. Insect and disease pests, like the deer tick, may become more common, creating health concerns for people and pets.

Taking Action

Prince Edward Island has been actively engaged in international efforts to combat climate change. These efforts include working with the Government of Canada to achieve the targets under the Paris Agreement and the long-standing regional commitment to reduce GHG emissions as part of the New England Governors and Eastern Canadian Premiers (NEG-ECP) Climate Change Action Plan.

The NEG-ECP Climate Change Action Plan, adopted in 2001, was the first international, multi-jurisdictional commitment to reduce GHG emissions. The plan established regional GHG emission reduction targets for 2010, 2020 and the longer term. The 2017 update adopted in Charlottetown in August, 2017, reports on progress and outlines possible future regional actions.

At the 2015 meeting of the Conference of the Parties (COP), which Prince Edward Island attended at the request of the Prime Minister, a landmark international agreement was reached, known as the Paris Agreement. While in Paris, Prince Edward Island also signed on to RegionsAdapt, which facilitates collaboration between state and regional governments to reduce the risks of climate change and build resilience. The Paris Agreement, which Canada ratified in 2016, laid the foundation of actions to combat climate change, at national and sub-national levels, beginning in 2020.

In 2016, Prince Edward Island was part of the development of the Pan-Canadian Framework on Clean Growth and Climate Change (PCF). The PCF is Canada's collective plan to grow the economy while reducing emissions and building climate resilience. The PCF has four main pillars: pricing carbon pollution; complementary measures to further reduce emissions across the economy; measures to adapt to the impacts of climate change and build resilience; and actions to accelerate innovation, support clean technology, and create jobs.

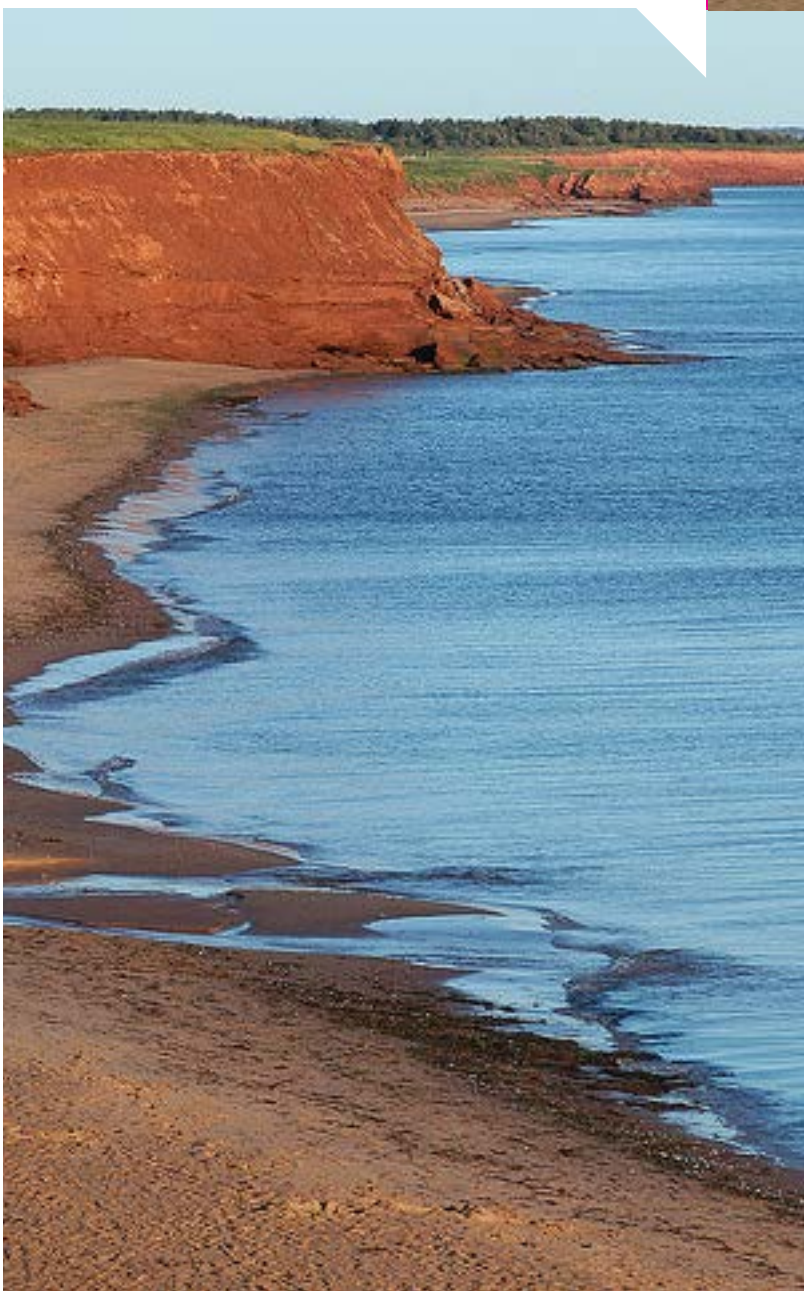
With respect to all of these commitments, Prince Edward Island continues to contribute to actions taken regionally, nationally, and internationally. The recently released PEI Energy Strategy and this Climate Change Action Plan align well with the agreements to which Prince Edward Island is party.

The Prince Edward Island Climate Change Action Plan will outline our Government's long-term, continuing commitment to prepare for a changing climate and reduce our GHG emissions. The Action Plan has a two-pronged approach:

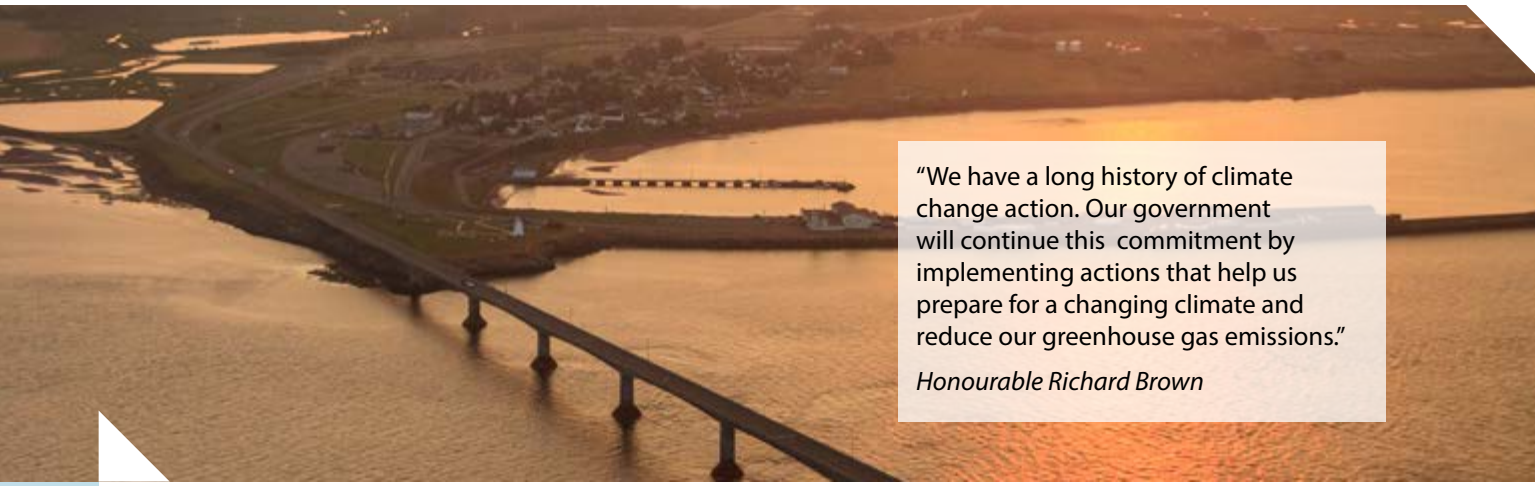
1. *reducing the impacts of climate change (adaptation); and*
2. *reducing the amount of GHGs that we emit (mitigation).*

Adaptation addresses the impact of climate change. We can reduce the impact of coastal flooding, for example, by building roads and homes on higher ground. Reducing GHG emissions addresses the cause of climate change. We can do this by driving lower emission vehicles, farming more sustainably, and heating our homes more efficiently.

This Action Plan promotes a clean, safe, innovative, and resilient future for Islanders today and in the generations to come.



Our Five-Year Plan



"We have a long history of climate change action. Our government will continue this commitment by implementing actions that help us prepare for a changing climate and reduce our greenhouse gas emissions."

Honourable Richard Brown

Climate change is not a new problem. In fact, we have taken important steps over the past 40 years to address this issue.

For example, Prince Edward Island leads the country in wind energy integration. Currently, 24 per cent of the province's electricity is provided by locally generated wind energy, making Prince Edward Island a world leader in this respect. Wind energy not only reduces GHG emissions, but also contributes to the economy, creating local jobs for Islanders, and providing a sustainable energy supply for residents and businesses.

(For more examples of Prince Edward Island's actions on climate change, see timeline in Appendix 1).

The new Climate Change Action Plan was created in response to key recommendations from the previously noted international agreements as well as the following provincially-developed documents:

Prince Edward Island Recommendation for the Development of a Climate Change Mitigation Strategy (2017) www.princeedwardisland.ca/en/information/climate-change-mitigation-recommendations-report

Prince Edward Island Climate Change Adaptation Recommendations Report (2017) www.princeedwardisland.ca/en/information/communities-land-and-environment/climate-change-adaptation-recommendations-report

Prince Edward Island Provincial Energy Strategy 2016/2017 www.princeedwardisland.ca/en/information/transportation-infrastructure-and-energy/energy-strategy

The public and various stakeholders provided valuable input into the process. Additional documents that helped influence the Action Plan can be found in Appendix 2.

The Action Plan includes five action areas:

1. Adapting to Climate Change
2. Reducing Greenhouse Gas Emissions
3. Carbon Sequestration
4. Education and Capacity Building
5. Research and Knowledge Building

Many of the actions in the Action Plan will be completed within the five-year window. Other actions will continue long after.

ACTIONS

Adapting to Climate Change

On-going Initiatives

Government is currently:

- investing in infrastructure upgrades that are increasing our resilience to climate change impacts;
- evaluating innovative approaches to shoreline protection;
- incorporating future climate extremes into emergency management planning;
- sustainably managing and protecting our water resources, now and under future climate conditions, through the new *Water Act*;
- requiring stormwater systems and structures on provincial highways and roads be designed to accomodate future extreme rainfall events; and
- assessing erosion and flood risk for new coastal developments.

Islanders are already aware that climate change is happening. Adapting our way of doing things will be critical if we are to successfully meet the challenges and opportunities presented by a changing climate.

Adaptation will require action across many sectors, including:

- how we design our infrastructure, including bridges and culverts;
- where we build our homes and businesses;
- how we manage our water resources;
- how we manage and protect our ecosystems; and
- which crops we grow.

Our Government continues to help local decision-makers better understand and prepare for the impacts of climate change.

Commitment #1

Government will take proactive measures to reduce Prince Edward Island's vulnerability to the impacts of climate change, and to take advantage of new opportunities that contribute to a prosperous and resilient economy.

- Infrastructure -

Our schools, hospitals, fire halls, bridges, businesses and homes will all be affected as our climate changes. The threat of these impacts will require that new approaches be taken as we design and locate our infrastructure. Improved design standards can ensure that structures will withstand new weather extremes. New development will be encouraged in areas less vulnerable to severe weather events. Options for existing infrastructure in at-risk areas may include moving to a less vulnerable location or protecting it with engineered solutions.

One approach that is gaining prominence is the use of green infrastructure, such as green roofs and permeable pavement. This type of infrastructure is intended to mimic natural processes and has emerged as a cost-effective, less energy intensive solution to some weather related problems.

NEW ACTIONS

Government will:

1. identify vulnerable public assets and infrastructure along the coast;
2. retrofit, relocate, or protect critical and vulnerable public infrastructure to address the impacts of climate change, as is feasible and cost-effective;
3. introduce new hazard guidance to inform development decisions and design in coastal areas; and
4. pilot green infrastructure projects for stormwater management and shoreline protection.

- Water Resources -

Changing rain and snowfall patterns, along with increasing temperatures will influence water resources in Prince Edward Island. This may challenge our ability to provide an adequate, reliable, and safe supply of drinking water along with the provision of water to maintain healthy ecosystems and supply industrial needs. Not only will the supply of water be influenced by climate change, but drier conditions will increase the demand for water. More extreme weather events, including heavy rainfalls, may overwhelm some wastewater management systems, leading to flooding and the release of untreated wastewater.

Prince Edward Island's new *Water Act*, introduced in 2017, will determine how water will be protected in the future. This legislation will ensure the sustainability of our water resources by establishing and enforcing new criteria for protecting the Island's water supply. This work will require collaboration between both provincial and municipal governments.

NEW ACTIONS

Government will:

5. model the impacts of climate change on streams, wetlands, and drinking water resources; and
6. promote and enhance water conservation efforts as a way to reduce demands on water and wastewater systems.

- Ecosystems -

As our climate changes, the suitability of habitats to support plant and animal populations and ecosystems will also change. Some species of plants may no longer be able to grow here. We may lose some fish species as fish habitats change and new distribution and migration patterns develop. New animal species may become established as the climate becomes more favourable for them. All these changes will affect the stability of our ecosystems.

Sustainability is a key feature of any healthy ecosystem. This requires that the ecosystem can maintain its function and make-up even in the face of stressful change. Actions that help maintain or improve the health of ecosystems can lessen the impact of climate change. These actions can include efforts to add additional habitat, reduce fragmentation of habitat, and enhance biodiversity (i.e., the variety of all living things present).

NEW ACTIONS

Government will:

7. increase the province's protected land base in order to connect habitats and enhance biodiversity; and
8. increase collaboration with watershed groups and other community organizations, building local capacity to improve habitat resilience.

Reducing Greenhouse Gas Emissions

Prince Edward Island's GHG emissions were 1.8 million tonnes of carbon dioxide equivalent (CO_2 eq) in 2016. On a per-capita basis, Prince Edward Island is among the lowest emitters in Canada at 12 tonnes per person.

Prince Edward Island's emissions come primarily from five areas: transportation, agriculture, buildings, industry, and waste (Figure 1). Transportation accounts for almost half of our GHG emissions. Many of these emissions come from passenger vehicles, such as cars, trucks, and SUVs. Transport trucks, airplanes, boats, and recreational vehicles also produce emissions.

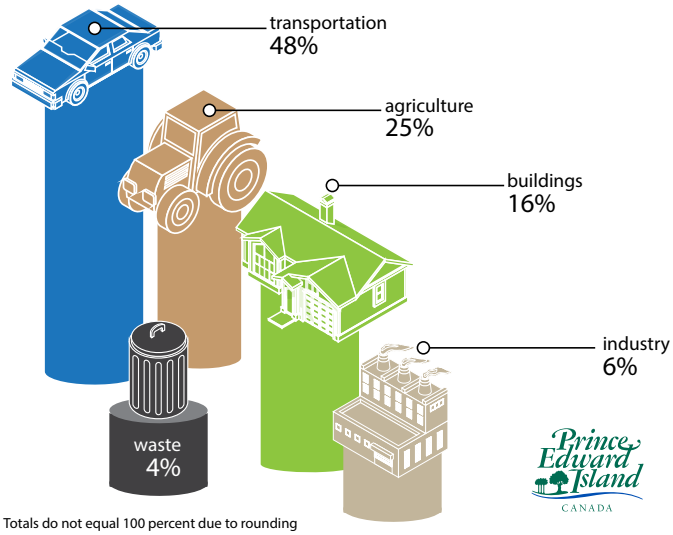
Agriculture is our second largest source of GHG emissions. Most farm-related emissions come in the form of methane and nitrous oxide, which are among the most potent GHGs. Methane emissions are mostly from livestock (e.g., cattle belching) and manure. Nitrous oxide emissions come from the use of nitrogen fertilizers in crop production.

Using fossil fuels to heat and cool our buildings accounts for less than 20 per cent of Prince Edward Island's emissions. This includes homes, businesses, schools, hospitals, and other institutions. Industries also produce emissions during the manufacture and processing of goods.

The disposal and treatment of waste, including municipal solid waste, compost, and wastewater, can produce GHGs. Garbage that is buried in landfills, for example, produces methane when it breaks down.

Estimated GHG emission reductions associated with the following actions are provided in Appendix 3.

Where do our greenhouse gases come from?



Totals do not equal 100 percent due to rounding

Figure 1

On-going Initiatives

Government is currently:

- constructing efficient roadways and roundabouts that save motorists time and money by reducing idling and emissions;
- diverting more waste per person from landfill than any other province;
- using sustainably harvested biomass (e.g. wood) to heat schools, hospitals, and other government facilities; and
- increasing the energy efficiency of new buildings through the adoption of the National Building Code and the National Energy Code for Buildings.

Commitment #2

Government, together with residents, businesses, and industries, will reduce provincial greenhouse gas emissions by 30 per cent below 2005 levels by 2030.

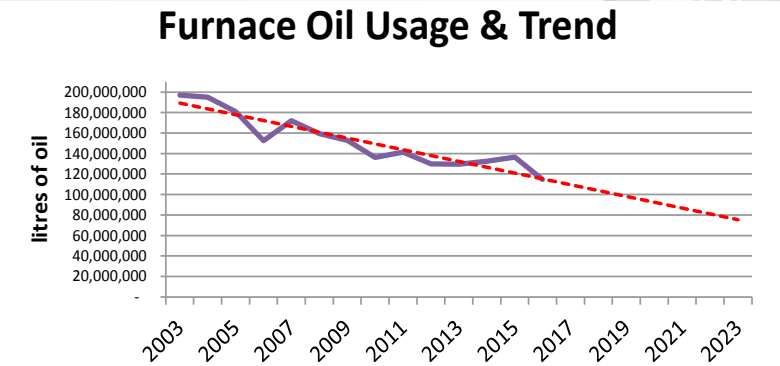


Figure 2

NEW ACTIONS

Government will:

9. provide Island residents, businesses, industries, and municipalities with more opportunities to reduce their energy consumption and switch to lower-carbon energy systems and technologies by offering new and expanded programs and services through **efficiencyPEI**; and

10. encourage the design of efficient and resilient communities through the development of a provincial land use policy.

- Built Environment -

There are many ways to reduce GHG emissions in both new and existing buildings. Over half of the energy we use in our homes is wasted (e.g. heat loss from homes). The most effective method of reducing emissions is to make buildings more efficient.

Most homes and buildings in Prince Edward Island still heat with home heating oil–a carbon-intensive fossil fuel. Switching how we heat our homes and buildings is an effective way to reduce emissions. This can include switching fuels or installing new, more efficient heating equipment. Using heat pumps (geo-thermal or air source) and burning wood are both alternative ways to heat our homes while producing fewer emissions. Existing programs have helped decrease furnace oil usage (Figure 2). Appendix 4 lists the programs **efficiencyPEI** will be offering to help Islanders reduce their GHG emissions.

We can also take important steps toward addressing climate change through the design of our communities. Land use planning helps direct how we move around and design our cities, towns, and communities. Planning can be a powerful tool to help reduce GHG emissions by ensuring that communities are walk-able and transit friendly. In well-designed communities, people live close to the places they work, shop, and visit, encouraging healthier and more active lifestyles.

NEW ACTIONS

Government will:

11. develop initiatives that contribute to a more sustainable transportation system; and
12. design and install a province-wide electric vehicle charging network to meet the needs of both residents and visitors to Prince Edward Island.

- Sustainable Transportation -

Sustainable forms of transportation include walking, biking, public transport, and driving low or zero emission vehicles. Where walking and biking are not possible and a vehicle is required, a fuel-efficient or electric vehicle is a viable alternative. Electric vehicles require less maintenance than conventional gasoline and diesel powered vehicles, are less expensive to run (e.g., saving $1,500-$2,000 per year on fuel), and eliminate GHG emissions and other forms of air pollution.

Over 1/2 million passengers rode the Charlottetown transit system in 2017, and ridership is growing each year.

NEW ACTIONS

Government will:

13. install 20 additional biomass heating systems in public buildings;
14. increase the use of electric vehicles in its light-duty vehicle fleet; and
15. implement a greening government program, including the development of a GHG emissions inventory for government, energy efficiency upgrades to provincial buildings, improved fuel efficiency of its vehicle fleet, and a commitment to green procurement.

- Government Leadership -

The Climate Change Action Plan signals our government's continued commitment to reduce greenhouse gases in its own operations.

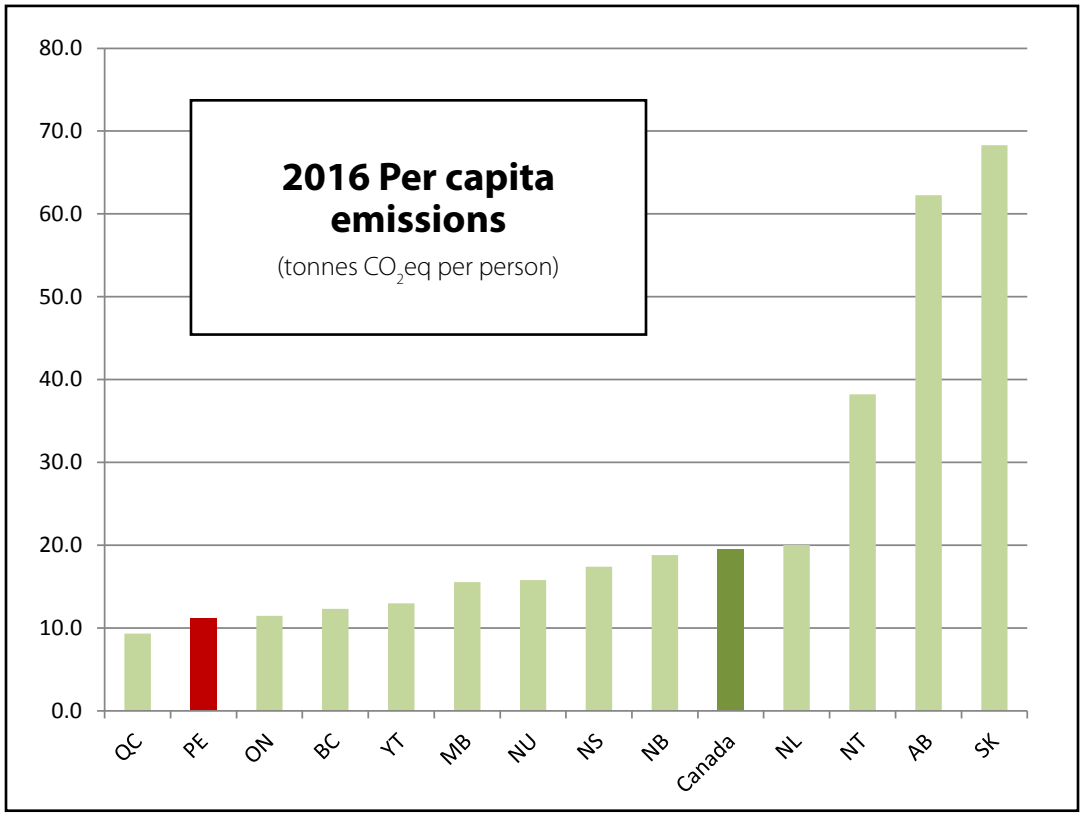
Over the past several years, 29 public buildings have been converted to biomass heating systems, greatly reducing the GHG emissions from these facilities. Heating is not the only area where government can improve its operations. Areas such as vehicle fleet management, green procurement, and energy conservation can yield significant emission reductions.

- Carbon Pricing -

Carbon pricing is an economic tool whereby a relative financial cost is applied to the use of fuels that contain carbon. The cost signal provided through relative carbon pricing is designed to encourage people to use less of these fuels and move to more environmentally friendly options.

In the fall of 2016, the Government of Canada announced that all provinces will be required to adopt some form of carbon pricing to achieve carbon mitigation goals. Prince Edward Island has sought a pricing solution that meets the objective of moving people away from carbon-intensive consumption and keeps a level field with our regional neighbours.

A first step has been to decrease the relative price of electric heating in homes. This 10% price reduction results in an overall $7.3 million per year in pricing differential and provides a clear price signal to encourage clean energy over carbon-intensive uses in home heating consumption.



As a province, PEI has the lowest overall emissions in Canada and is the 2nd lowest per capita emitter.

We continue to work to achieve the goals of the Pan-Canadian Framework for Clean Growth and Climate Change and being alert to regional and national objectives, including an overall approach to carbon pricing that makes sense for the residents and economy of Prince Edward Island. As a province, PEI is the smallest emitter in Canada and has the second lowest per capita emissions.

NEW ACTIONS

Government will:

16. Work to achieve the goals of the Pan-Canadian Framework and, through relative pricing on cleaner energy, mitigation efforts and clean growth, building on PEI's existing record of low emissions.
17. Adopt the federal backstop for industrial emitters.
18. Ensure exemptions are applied to marked fuel in the agriculture and fisheries sectors.

Carbon Sequestration

We can use carbon sequestration to remove GHGs from the atmosphere. As we plant more trees, more carbon is absorbed by them.

Trees, plants, soils, and wetlands have the ability to absorb carbon dioxide from the atmosphere. Trees store carbon as biomass (trunks, branches, roots and leaves). The removal and storage of carbon from the atmosphere is called carbon sequestration.

We can use carbon sequestration to remove GHGs from the atmosphere. As we plant more trees, more carbon is absorbed by them. This will offset the amount of GHGs we will need to reduce elsewhere in order to meet our GHG emission reduction target.

However, trees do not store carbon indefinitely. Some of the carbon stored in our woodlands and forests is released back into the atmosphere when trees die and decompose. Forest fires will also release the sequestered carbon back into the atmosphere. These factors must be considered when using carbon sequestration to help contribute to our GHG emission reduction target.

Estimated carbon sequestration associated with the following actions is provided in Appendix 3.

On-going initiatives

Government is currently:

- partnering with non-profit environmental groups to assist in the purchase and protection of new natural areas;
- growing about 750,000 trees and shrubs each year, including over 30 different species in a variety of sizes, for reforestation efforts on public and private lands; and
- partnering with over 425 farmers and landowners, through the community-developed, farmer-delivered Alternative Land Use Services Program, to achieve environmental outcomes, including carbon sequestration.

Commitment #3

Government will work to protect and enhance the ecosystem, while encouraging practices that increase carbon sequestration.

NEW ACTIONS

Government will:

19. reforest areas, targeting abandoned or marginal agricultural land to increase biodiversity and enhance carbon sequestration;
20. model and report province-wide carbon sequestration in the State of the Forest Report; and
21. increase support for existing funding programs such as the Alternative Land Use Services (ALUS) program and the Forest Enhancement Program (FEP) to expand carbon sequestration opportunities and enhance resilience.

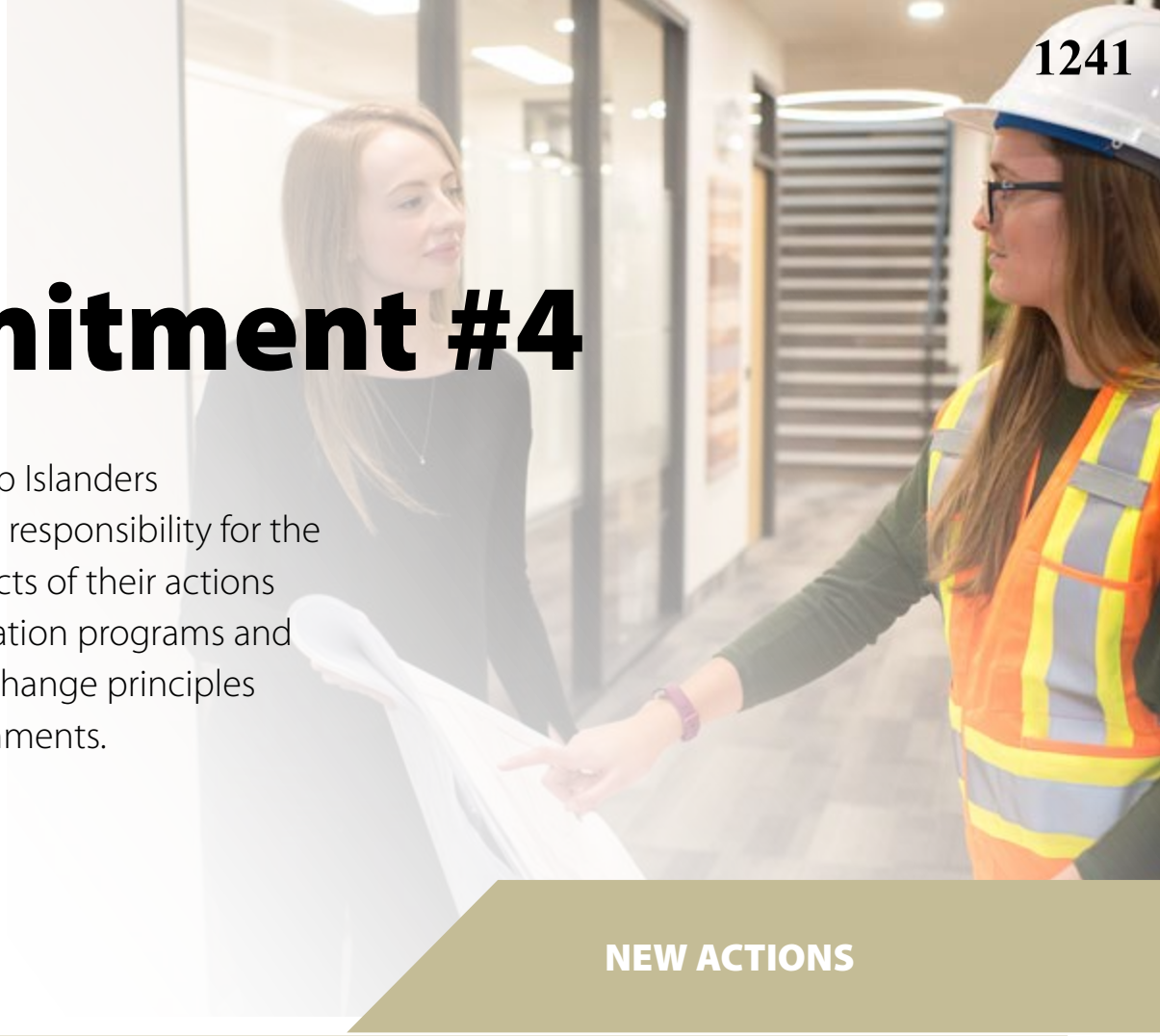
Education and Capacity Building

In order for Islanders to respond effectively to the challenges associated with climate change, we will all need to increase our awareness of the issues at hand, and to build upon our strengths and skill sets. New education and training opportunities need to be provided to students, professionals, community groups, and other stakeholders who are involved in the work of addressing climate change. All Islanders—communities, businesses, and residents alike—will be encouraged to play their part.

On-going initiatives

Government is currently:

- sponsoring workshops, seminars, and activities to improve climate change awareness;
- promoting the Coastal Community Adaptation Toolkit, a product that helps communities identify engineering and land use planning solutions to adapt to climate change; and
- informing coastal property owners of current and future hazards by promoting the PEI Coastal Property Guide.



Commitment #4

Government will help Islanders understand and take responsibility for the environmental impacts of their actions by developing education programs and integrating climate change principles into learning environments.

NEW ACTIONS

Government will:

22. develop initiatives to inform, educate, and motivate Islanders about the many implications of climate change;
23. incorporate climate change principles and issues into the K-12 learning environment;
24. enhance capacity amongst engineers, planners, emergency management personnel, and other practitioners by supporting learning opportunities that integrate climate change considerations into their professional development;
25. integrate climate change considerations in its policies, procedures, decisions, long term strategies and financial planning. Government will also support similar integration at the municipal level of government;
26. develop and share coastal hazard maps incorporating the latest information on future sea level rise, storm surge, and coastal erosion; and
27. facilitate and support sharing of information, knowledge, and best practices that will enable sectors and disciplines to learn from each other.

Research and Knowledge Building

Research, monitoring, and adoption of of new technologies and innovative approaches all have an important role to play in advancing our efforts to reduce GHG emissions and adapt to a changing climate.

New technologies and innovative approaches are needed in many of our economic sectors. In agriculture, for example, barriers exist that prevent widespread adoption of solutions such as nutrient stewardship, conservation cropping, and livestock feeding strategies.

Accurate and accessible climate-related information and knowledge, including Traditional Knowledge, will form the foundation of our efforts to address climate change. Although monitoring networks currently exist, expanded monitoring networks and approaches are needed to further develop hazard maps and conduct risk assessments. These will help identify our most threatened locations, economic sectors, and day-to-day activities, and show us where to act first.

On-going initiatives

Government is currently:

- supporting the UPEI Climate Lab's coastal erosion monitoring network, including the use of drone imagery and analysis;
- studying the electricity rate-structure in order to maximize benefits from renewable sources of electricity and accommodate future electrification of the transportation system;
- monitoring and ensuring that well field extraction rates maintain surface water flow in streams and wetlands, and groundwater extraction practices protect groundwater and surface water resources now and into the future; and
- collaborating with the UPEI Climate Lab to inventory and evaluate the effectiveness of shoreline protection strategies.

Commitment #5

Government will work with Indigenous, provincial, and regional partners to advance climate change research and knowledge in Prince Edward Island.

NEW ACTIONS

Government will:

28. explore opportunities to integrate Traditional Knowledge into provincial adaptation approaches;
29. support research, monitoring, and modeling of climate change through local and regional partnerships;
30. assess future climate impacts upon sectors and stakeholders to help prioritize efforts to adapt to climate change;
31. deploy new tide monitoring stations to better measure storm surge and sea level rise; and
32. consult with farmers to develop a series of farm practices that reduce GHG emissions and better sequester carbon. Farm-specific GHG reduction plans will be piloted on 20 to 30 participating farms.

Currently, 24 per cent of the province's electricity is provided by locally generated wind energy, making Prince Edward Island a world leader in this respect.

MEASURING AND REPORTING SUCCESS

This Action Plan outlines the actions Government will implement to adapt to a changing climate and reduce our GHG emissions. In the weeks, months, and years to come, implementation plans will be developed for each action item. These plans will provide more detailed information on each action, including who will lead its implementation, when it will be completed, and how its success will be measured.

Meeting our Target

Our new GHG emission reduction target—30 per cent below 2005 levels by 2030—will serve as a key indicator, measuring the success of efforts to reduce emissions. Meeting our target will require annual emissions to decrease to less than 1.4 million tonnes (Mt) of CO_2e by 2030. On-going initiatives are expected to reduce annual emissions to 1.6 Mt of CO_2e by 2030.

The actions in the Climate Change Action Plan are expected to further reduce annual emissions by 0.2 Mt of CO_2e by 2030 (see Appendix 3). These, along with future actions, will ensure we meet the target.

Annual Reporting

Reporting our progress to the public will ensure transparency and provide an opportunity to change course if needed. It will allow government and others to gauge where we are and how far we still have to go. The annual updates will be provided as a status report and posted on the Climate Change Action Plan webpage.

Our new GHG emission reduction target—30 per cent below 2005 levels by 2030—will serve as a key indicator, measuring the success of efforts to reduce emissions.

DOING YOUR PART

We are all contributing to the warming of our planet. The good news is that we can all be part of the solution. We can make small or large changes that reduce our contribution to climate change and minimize its impacts. In addition to protecting the environment, these changes can also help us save money and lead healthier lifestyles. The following tips are just some of the things we can all do to make a difference.

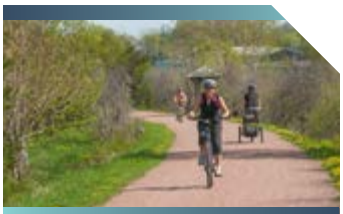
We are all contributing to the warming of our planet. The good news is that we can all be part of the solution.

Grade your yard. Ensure your lot is properly graded, so that water can drain away from your basement walls.

Insulate your basement. Insulating a basement can be one of the easiest ways to improve your home's energy efficiency, especially if it's an older home. You can save up to $1,000 each year by making this change. An insulated basement can prevent moisture problems and can also keep those rooms directly above warmer. **efficiencyPEI**'s Home Insulation Rebates program can provide support for these upgrades.

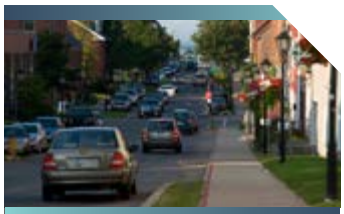
Buy a fuel-efficient vehicle. The next time you are in the market for a new vehicle, buy the most fuel efficient vehicle that meets your everyday needs. Choosing a smaller, fuel efficient vehicle can reduce your GHG emissions by up to one tonne of CO_2e each year, and save money on fuel costs.

Cover window wells. Cover window wells to prevent water from accumulating and entering your home around basement windows. Transparent window well covers will still allow light to get in.



Drive less

Use public transit, bike, walk, or carpool with a friend or neighbor. Prince Edward Island boasts extensive walking and biking trails. Daily municipal transit services are also available in Charlottetown, Cornwall, Stratford, and Summerside.



Don't idle

If you stop for more than 10 seconds, except in traffic, turn off your engine. For more information, visit the Idle-Free Zone at http://www.nrcan.gc.ca/energy/efficiency/communities-infrastructure/transportation/idling/4397

Plant trees and shrubs

Planting trees and shrubbery can significantly reduce runoff during heavy rainfall events, especially if your property is sloped. These plants can also shade your home, making it more comfortable on hot, summer days.

Use a rain barrel

Place rain barrels under roof downspouts to capture water from rainfall. This relieves pressure on your community's stormwater system and can reduce the likelihood of flooding. You can also use rain water on flower and vegetable gardens.

Choosing a smaller vehicle can reduce your GHG emissions by up to one tonne per year.

Seal air leaks. Use caulking and weather-stripping to seal air leaks around doors, windows, baseboards, attic hatches, and outlets. This can significantly reduce your heating costs, and save up to $500 every year. **efficiencyPEI**'s Winter Warming program offers a caulking and weather-stripping service free of charge to Islanders with annual household incomes of less than $50,000. For more information, contact them at **efficiencyPEI**@gov.pe.ca or 1-877-734-6336 (toll free).

Lower the thermostat. Turn down the heat when you are away from home and at night. For every 1°C (2°F) you lower your thermostat, you save 2 per cent on your heating bill. A programmable or SMART thermostat can do this for you automatically.

Appendix 1

Climate Change Action Timeline

1981

Atlantic Wind Test Site was established in North Cape.

1983

District heating system (PEI Energy Systems) was developed. Biomass and solid waste combustion helps heat over 80 buildings in Charlottetown.

1984

Waste Watch began as a pilot program in East Prince. Today, Islanders each divert an average of 429 kg of waste from landfill each year.

2001

Conference of New England Governors and Eastern Canadian Premiers endorsed the **Climate Change Action Plan** outlining GHG emission reduction goals for the region and approaches for meeting those goals.

PEI Energy Corporation opens Atlantic Canada's first utility-scale **wind farm at North Cape**.

2004

Energy Framework and Renewable Energy Strategy was released with 19 action items, many focused on advancing the incorporation of renewable energy into the provincial energy mix.

2005

Charlottetown Transit system was launched. Over 1/2 million passengers rode the Charlottetown system in 2017.

2007

30 MW **wind farm began operation in East Point**. The clean electricity produced at this site displaces the same amount of GHG emissions as that produced by 16,000 cars each year.

2008

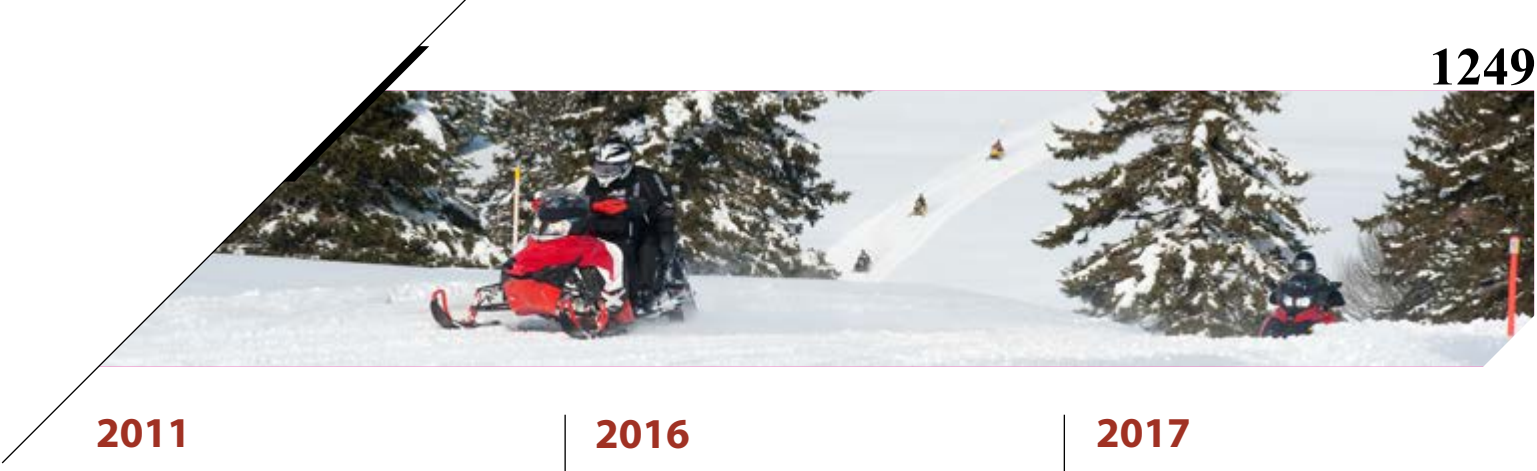
Prince Edward Island's **Alternative Land Use Services (ALUS) program** was launched. It remains the only provincially supported, province-wide ecological goods and services program in Canada.

Prince Edward Island and Climate Change - **A Strategy for Reducing the Impacts of Global Warming** was released.

Office of Energy Efficiency opened. Now called **efficiencyPEI**, it has helped save Islanders over $9 million on their energy bills.

2009

Prince Edward Island co-founded the **Atlantic Climate Adaptation Solutions Association** (ACASA), a regional government collaborative to address climate change impacts.



2011

PEI Energy Accord took effect. The Accord started plans for a new provincial cable, invested in the clean power of Point Lepreau, and ended our relationship with the coal-fired Dalhousie power plant.

2012

Cavendish Farms switched to natural gas, achieving a 28 per cent reduction in GHG emissions.

2014

Government partnered with UPEI Climate Lab to begin **monitoring coastal erosion** at over 100 sites across Prince Edward Island.

2015

Prince Edward Island supported Canada's position in the development of the **Paris Agreement,** the most recent international agreement from the United Nations Framework Convention on Climate Change.

Prince Edward Island signed onto **RegionsAdapt**, which facilitates collaboration between state and regional governments to reduce the risks of climate change and contribute to resilience.

2016

The **PEI Coastal Property Guide** was released to help coastal property owners understand current and future hazards.

Prince Edward Island signed onto the **Vancouver Declaration** committing provinces and territories to ambitious action on climate change.

Canada became a signatory to the **Paris Agreement** in 2016, agreeing to the foundation of actions to combat climate change, at national and sub-national levels, beginning in 2020.

Prince Edward Island established a **Climate Change Secretariat**.

Prince Edward Island signed onto the **Pan-Canadian Framework** for Clean Growth and Climate Change, after chairing the Adaptation and Climate Resilience Working Group.

2017

Prince Edward Island **Provincial Energy Strategy** 2016/2017 was released.

Conference of New England Governors and Eastern Canadian Premiers released an updated **climate change action plan.**

A *Water Act* for Prince Edward Island was created to protect, conserve and enhance the province's water resources.

Appendix 2

Climate Change Policy Documents

Prince Edward Island Provincial Energy Strategy 2016/2017

www.peiec.ca/uploads/6/6/6/4/66648535/pei_energy_strategy_march2017_web.pdf

2017 Update of the New England Governors and Eastern Canadian Premiers Regional Climate Change Action Plan

www.coneg.org/Data/Sites/1/media/documents/reports/2017-rccap-final.pdf

Pan-Canadian Framework on Clean Growth and Climate Change (2016)

www.canada.ca/en/services/environment/weather/climatechange/pan-canadian-framework.html

Vancouver Declaration (2016)

https://pm.gc.ca/eng/news/2016/03/03/communique-canadas-first-ministers

Paris Agreement (2015)

https://unfccc.int/process/the-paris-agreement/what-is-the-paris-agreement

RegionsAdapt (2015)

http://www.nrg4sd.org/climate-change/regionsadapt/

Prince Edward Island: Planning for a Sustainable Future - A Time For Questions (2012)

www.gov.pe.ca/photos/original/susfuture.pdf

PEI Energy Accord: Backgrounder (2010)

www.gov.pe.ca/photos/original/energyaccord.pdf

Prince Edward Island and Climate Change: A Strategy for Reducing the Impacts of Global Warming (2008)

www.gov.pe.ca/photos/original/env_globalstr.pdf

Prince Edward Island Energy Strategy. Securing our Future: Energy Efficiency and Conservation (2008)

http://www.gov.pe.ca/photos/original/env_snergystr.pdf

Island Wind Energy Securing our Future: The 10 Point Plan (2008) http:/

www.gov.pe.ca/photos/original/wind_energy.pdf

Appendix 3

Estimated GHG Emission Reductions

This table provides estimated annual GHG emission reductions and removals that will be achieved in 2030 by this five-year Action Plan. Future measures beyond the life of this Plan are expected to reduce GHG emissions further.

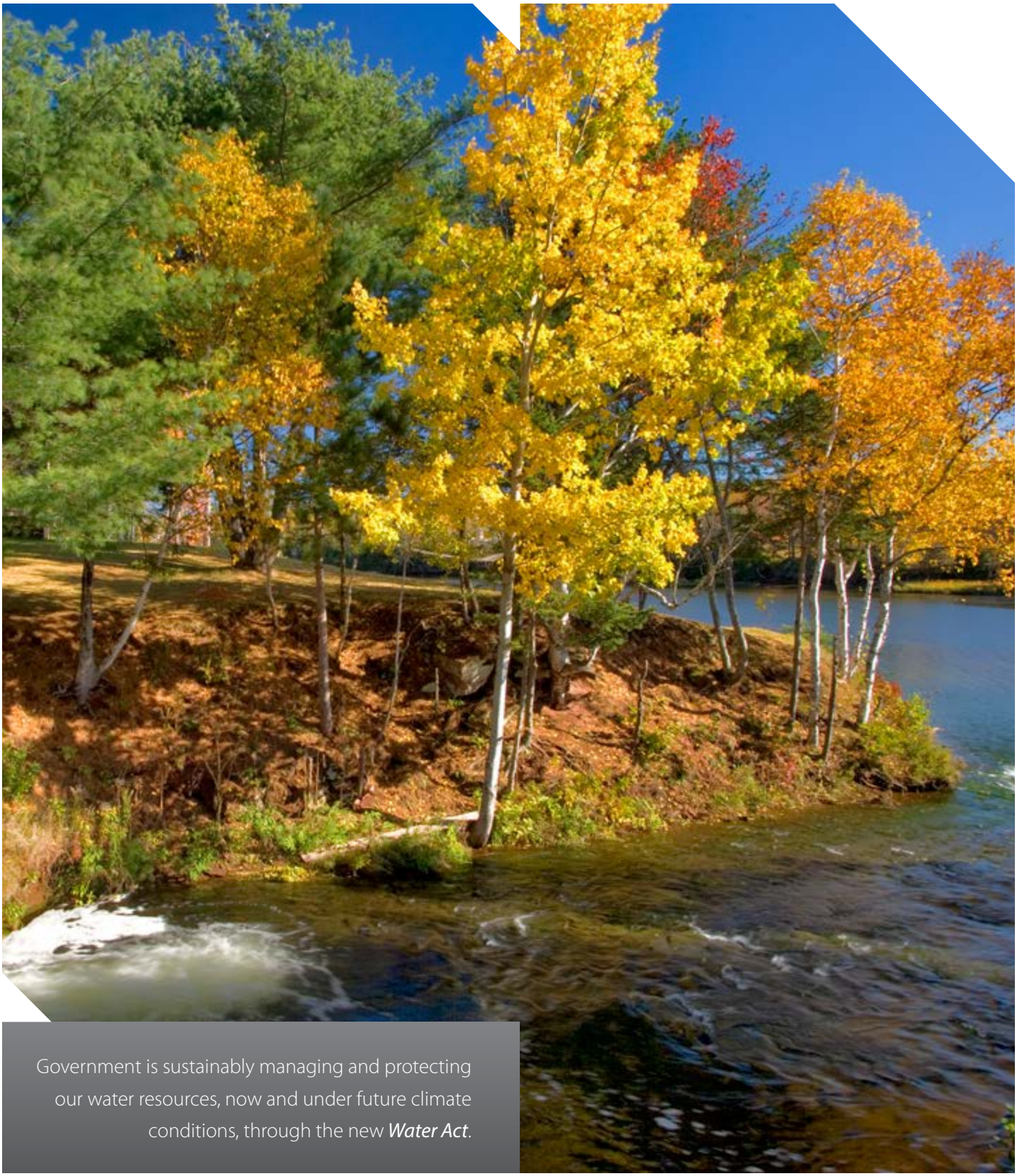
Action		Description	Estimated Annual Emission Reductions or Removals in 2030 (tonnes CO_2 eq)
Energy Efficiency	#9	uptake of **efficiencyPEI**'s home and business energy efficiency programs	140,000
Efficient Communities	#10	adoption of land use planning policies that encourage compact development and co-location of people and service centres	TBD[1]
Sustainable Transportation	#11	implementation of new sustainable transportation options	TBD[1]
Electric Vehicles	#12 & #14	expanded electric vehicle charging infrastructure and promote the adoption of electric vehicles	20,000
Biomass Heating	#13	installation of 20 biomass heating systems in government buildings	4,000
Greening Government	#15	reduced energy use in provincial government facilities through **efficiencyPEI**	6,000
Carbon Pricing	#16	an economic tool whereby a relative financial price is applied to the use of fuels that contain carbon	TBD[1]
Forest Planting	#17	establish new forests on abandoned and marginal agricultural land	10,000
ALUS and FEP	#19	Increase support for these programs to expand carbon sequestration opportunities	TBD[1]
		TOTAL	**180,000**

Appendix 4

Energy Efficiency and Fuel Switching Programs

Program	Description
Home Energy Assessment	This program incentivizes building envelope upgrades (insulation, air sealing) and provides homes with an EnerGuide rating. Pre and post energy audit is required ($99+HST to homeowners).
Home Comfort	Offered in conjunction with the Department of Family and Human Services (FHS) Home Renovation Program, this program provides comprehensive energy upgrades to low-income clients free of charge. All clients who are approved through FHS receive an energy audit, and energy-saving measures are implemented free of charge.
Home Insulation Rebates	This program provides rebates for building envelope upgrades (insulation, air sealing, windows, doors). Pre and post energy audit is required ($99+HST to homeowners).
Energy Efficient Equipment Rebates	This program provides rebates for energy efficient equipment upgrades (heating systems, heat pumps). No energy audit is required.
Business Energy Rebate	This program provides mail-in rebates for approved equipment for businesses/agriculture. Rebates are promoted in-store and by contractors, but processed at **efficiencyPEI**.
Winter Warming	Previously the Home Energy Low Income Program (HELP), this program assists clients with household income of less than $50,000, beginning with a 20 minute discussion with the homeowner about energy efficiency and programs. The clients then receive air sealing, weather-stripping, programmable thermostats, replacement of all non-LED bulbs, electric hot water tank and pipe wrap, and attic hatch insulation. Assistance is provided free of charge.
On-site Energy Manager	This program makes available **efficiencyPEI** staff that are dedicated to specific industries/sectors. Staff work directly with clients on-site to identify opportunities and manage upgrades and projects. This program is likely to be delivered as part of the Custom Energy Solutions program.
Government Biomass and Efficiency Programs	This program targets government facilities through funding for projects to reduce energy consumption, assistance to install biomass systems (chips or pellets), and support for energy efficiency upgrades.
Instant Savings	This program provides point of sale/in-store discounts on efficient products. Discounts for lighting and small appliances will be offered periodically While discounts for large appliances will be available year round.
Business Energy Solutions	This program complements the rebates available under Business Energy Rebates program by providing coverage for energy audits, larger equipment, and envelope upgrades. This customized and interactive program targets businesses and the agriculture sector.
Custom Energy Solutions	This program provides customized energy savings options for businesses and the agriculture sector, including the deployment of an On-site Energy Manager (OEM). This program focuses on industrial processes and equipment development.
Community Out-reach and Marketing	This program includes ongoing outreach to the public as well as key industries/stakeholders (businesses, builders, contractors) as programming continues to expand.

For more information contact **efficiencyPEI** toll-free at 1-877-7634-6336 or efficiencypei@gov.pe.ca



Government is sustainably managing and protecting our water resources, now and under future climate conditions, through the new ***Water Act***.

From small things, big things come

There is no longer any doubt that our climate is changing and this presents a number of challenges for Prince Edward Island. It drives where we build our homes and businesses, what crops and shellfish we harvest, and all aspects of our economy. This is not a distant problem—one that we can avoid dealing with for years or decades to come.

The good news is that there are practical solutions for Islanders. The actions from this document will help each and every one of us prepare for a changing climate and reduce our greenhouse gas emissions. As an island province, we are in the unique position to see how climate change impacts us, and how the results of our actions can make a difference.

As we insulate our houses, we are saving ourselves money and reducing our emissions at the same time. We have the opportunity to make significant changes, and history shows that our small population does not deter us from doing great things.

The Mighty Island

This action plan is meant to benefit Islanders,
it is now up to all of us to make the changes we need to.

princeedwardisland.ca/climatechange

Prince Edward Island
CANADA

Toward a Greener Future

Nova Scotia's Climate Change Action Plan

January 2009

NOVA SCOTIA
Environment

1256

Printed in Canada
ISBN 978-1-55457-261-8

© Crown copyright, Province of Nova Scotia, 2009

For further information about *Toward a Greener Future: Nova Scotia's Climate Change Action Plan* please contact the

Nova Scotia Department of Environment
PO Box 442
Halifax, NS
B3J 2P8

Email: climatechange@gov.ns.ca
Phone: 902-424-3600
Website: www.climatechange.gov.ns.ca

FSC
www.fsc.org Cert no. XX-COC-XXXX
© 1996 Forest Stewardship Council

Toward a Greener Future

Nova Scotia's Climate Change Action Plan

January 2009

NOVA SCOTIA
Environment

Table of Contents

Summary **1**
I. Why We Must Act **3**
II. A Climate Change Primer **5**
III. Plan Overview **7**
IV. Climate Change Actions **13**
Cleaner Energy—Actions 1 and 2 13
Energy Efficiency—Actions 3 to 11 14
Commercial buildings
Residential buildings
Appliances
Renewable Energy—Actions 12 to 18 17
Transportation—Actions 19 to 27 20
Air Quality—Actions 28 to 35 22
Acid rain
Smog
Sulphur dioxide (SO2)
Nitrogen oxides (NOx)
Particulate matter and ozone
Mercury
Leadership by Example—Actions 36 to 44 25
Provincial government buildings
Provincial government vehicles
Office equipment
Engagement and Education—Actions 45 to 52 27
Municipalities
Government of Canada
Citizens
Adapting to Climate Change—Actions 53 to 66 29
Measurement and Accountability—Actions 67 and 68 33
V. Conclusion **34**
Appendix: Climate Change Actions **35**
Acknowledgments **42**

Summary

Most of the world's governments accept the 2007 report from the United Nations' Intergovernmental Panel on Climate Change (IPCC). Among its key conclusions is that human activity is warming the planet, with severe consequences. We can expect warmer average temperatures, rising sea levels, and more-frequent extreme storms. Nova Scotia is particularly susceptible to these changes because most of our population lives along the coastline, and much of our infrastructure is located in vulnerable areas.

Nova Scotia's Climate Change Action Plan has two main goals: reducing our contribution to climate change by reducing our greenhouse gas (GHG) emissions and preparing for changes to our climate that are already inevitable.

REDUCING GREENHOUSE GAS EMISSIONS

Target: 5 megatonnes annually by 2020

Nova Scotia aims to reduce GHG emissions by at least 10 per cent from 1990 levels by 2020.

Electricity generation

The greatest single reduction will be achieved by imposing caps on emissions from Nova Scotia Power Incorporated (NSPI), which produces 46 per cent of the province's GHG emissions. The caps will take effect in 2010, 2015, and 2020.

The two most cost-effective means of reducing emissions from power generation in Nova Scotia are straightforward: generating less electricity and generating it from clean, renewable sources.

We will also reduce our dependence on fossil fuels, which are expected to rise in cost over the long term.

Transportation

Transportation is the second-biggest source of GHG emissions in Nova Scotia. This plan focuses on increasing the efficiency of our vehicles, encouraging alternatives,

and planning our communities to reduce the need for transportation. The province's response will include

- by 2010, a Sustainable Transportation Strategy that will build on existing work
- a pilot project to help make commercial trucks more efficient
- incentives for consumers to choose cars and trucks that use less fuel and produce less air pollution
- by 2010, regulations setting fuel consumption and emissions standards for new vehicles

Air pollutants

Because efforts to reduce air pollutants and GHG emissions can affect each other, this plan takes an integrated approach to controlling both types of emissions. It includes new air pollutant caps for 2015 and 2020.

Other actions

Numerous other initiatives will encourage energy efficiency, government leadership, and public education.

ADAPTING TO CLIMATE CHANGE

Our climate will continue to change. We will have to adapt to warmer average temperatures, higher sea levels, and weather events that are more frequent and more extreme.

This plan includes nine actions devoted to adaptation, starting with the creation of an Adaptation Fund for research and development.

I. Why we must act

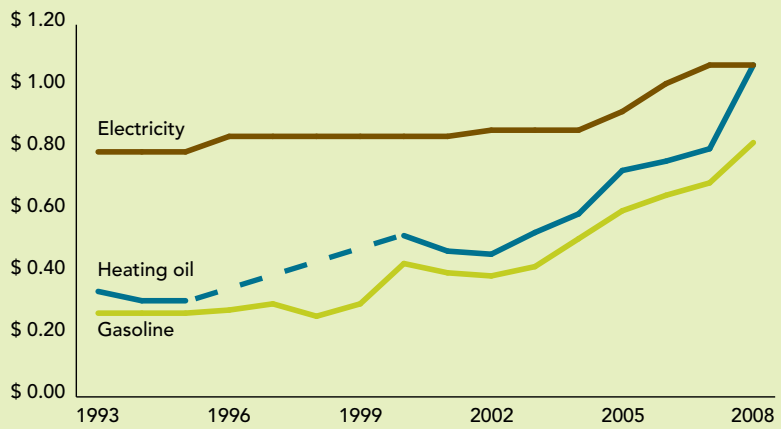
When it comes to climate change, Nova Scotia faces a triple threat:

- Because most of the energy we use comes from fossil fuels, we have an unusually long way to go in curbing the emissions that cause climate change.
- We're at the northern end of the Atlantic hurricane track, where more storms similar to Hurricane Juan could hit us as the planet warms.
- With 7600 km of coastline, we are exceptionally vulnerable to rising sea levels caused by climate change.

Our reliance on fossil fuels also makes us vulnerable to price spikes, as affordable supplies dwindle and markets swing. In the summer of 2008, oil prices reached historic highs, straining our economy and household budgets.

When it unanimously passed the Environmental Goals and Sustainable Prosperity Act, the Nova Scotia House of Assembly recognized that getting off fossil fuels isn't just the right thing to do, it's the smart thing to do. Establishing Nova Scotia as one of the cleanest and most sustainable environments in the world by 2020 is our best ticket to a prosperous economy for ourselves, our children, and our grandchildren.

Consumer energy prices 1993–2008



Assumptions

- Gasoline is regular unleaded price per litre for Halifax.
- Heating oil is price per litre for Halifax.
- Electricity is price per 10 additional kilowatt hours above the 200 kilowatt hour per month threshold in the residential class.
- Prices exclude taxes.

Source: NSPI, NRCAN Fuel Focus, and MJ Ervin

The act requires that, by 2020, we reduce Nova Scotia's GHG emissions to a point at least 10 per cent below 1990 levels. That's about 20 per cent below current levels. This is also a goal shared by the New England governors and eastern Canadian premiers.

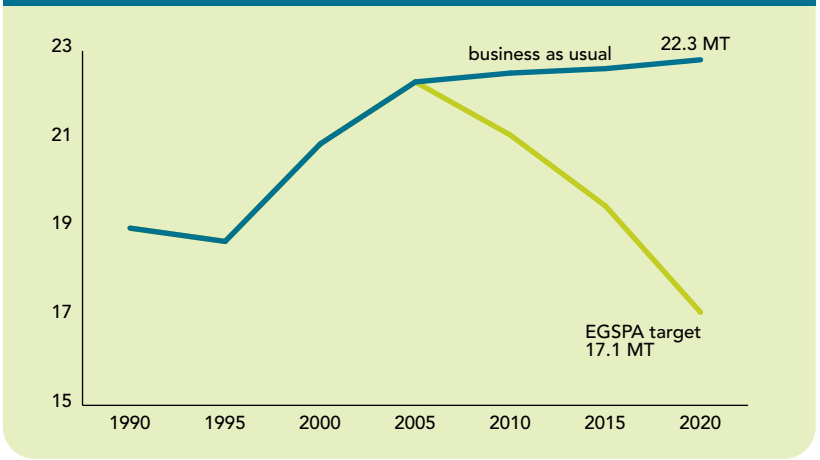
GHG emissions are measured in tonnes of carbon dioxide, the gas most responsible for human-made climate change. To comply with the law, we will have to eliminate about five megatonnes (MT)—or five million tonnes—of carbon dioxide emissions from our current production. It's a tall order, and it will require a big effort.

Assumptions

- We assume little or no growth in population from 2010 to 2020, and assume NSPI estimate (IRP) of 2% annual growth in electricity use.
- Total reductions from business as usual 2020 of 22.3 MT (DOE estimate) must be 5.2 MT to meet EGSPA target of 17.1 MT.

Source: Environment Canada and Nova Scotia Department of Environment

Nova Scotia GHG emission trends (CO_2 equivalent magatonnes)



The Environmental Goals and Sustainable Prosperity Act also reflects public concern about health impacts linked to air quality. It requires cuts in pollutants known to harm health, including nitrogen oxides (NO_x), sulphur dioxide (SO_2), mercury, fine airborne particles, and chemicals that produce ground-level ozone. Airborne particles and ground-level ozone are the main components of smog.

II. A Climate Change Primer

GHGs—mainly carbon dioxide, methane, and nitrous oxide—trap energy produced by the sun. When these gases are present in the air, they act like the glass roof of a greenhouse, allowing sunlight to reach the Earth, but preventing heat from radiating back out into space. Ever so slowly, this causes our planet to warm.

In 2007, the United Nations' Intergovernmental Panel on Climate Change (IPCC) produced a report on climate change that most world governments regard as authoritative. Among its key conclusions:

- The Earth is getting warmer, and human activity is causing most of the change.
- Melting icecaps and warmer ocean waters are causing sea levels to rise.
- The amount of greenhouse gas in the atmosphere is now far higher than at any time over the past 650,000 years.
- Most of the increase in average temperatures since 1950 is very likely due to increases in GHG concentrations caused by humans.
- The chance that natural climatic processes alone caused this warming is less than 5 per cent.
- Future increases in temperature and sea level depend mainly on how much fossil fuel we use.
- There is a lag between the production of GHGs and climate change. So even if we stabilize GHG production, the Earth will continue to warm, and seas will continue to rise.

The implications for Nova Scotia are sobering:

- In the 20th century, the average temperature in the province rose by half a degree Celsius. In the 21st century, we can expect it to rise by another 2° to 4° C. Many scientists believe that the upper end of this range entails catastrophic, irreversible consequences.
- Over the last 100 years, the sea level rose 25 cm; it is likely to rise a

further 60 cm or more by 2100. That means water levels may be almost a metre higher than they were in 1900.

- Extreme rainfalls that occurred only once every 50 years in the last century are likely to occur once every 10 years in this century.
- Storm surges that occurred only once in the 20th century may occur up to 10 times in the 21st century.

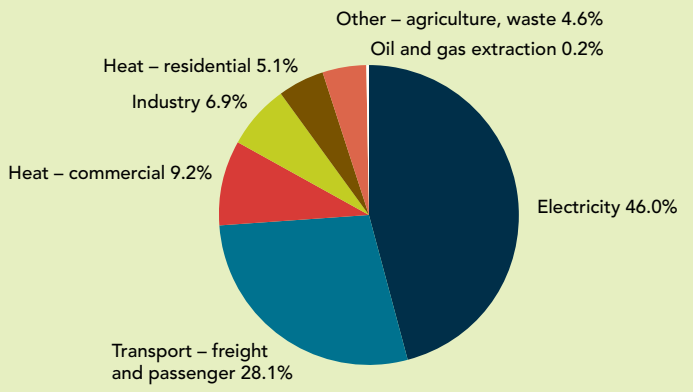
III. Plan Overview

A generation ago, faced with steep increases in the cost of oil, Nova Scotia committed to producing electricity from coal. The policy made sense. It replaced an imported fuel (oil) with a local fuel (coal). The production of coal employed a lot of Nova Scotians in communities with severe unemployment. At the time, few people had even heard the notion that burning coal could affect our climate.

GHG emissions are an unforeseen legacy of this policy. Today, the production of electricity accounts for about half of Nova Scotia's GHG emissions. Transportation, chiefly through the use of gasoline and diesel fuel, accounts for about 25 per cent of our GHG production.

The Climate Change Action Plan concentrates on these two sectors to meet our GHG target and also includes measures to reduce GHG emissions from heating homes and commercial buildings.

Emissions inventory 2005



Source: Environment Canada, revised May 2008

The plan takes a practical approach by investing in energy efficiency and renewable energy—the most cost-effective actions with the greatest impact on the production of GHGs.

It sets short-term, medium-term, and long-term targets that we can use to measure our progress.

SHORT-TERM TARGET

By 2015, the province will be at least half-way to our 2020 target by reducing GHG emissions by 2.5 million tonnes from today's levels.

MEDIUM-TERM TARGET

By 2020, the province will reduce GHG emissions to at least 10 per cent below 1990 levels.

LONG-TERM TARGET

By 2050, the province will reduce GHG emissions from human sources by up to 80 per cent below current levels, guided by the most up-to-date scientific consensus on required reductions.

ACHIEVING THE GHG TARGET

The Environmental Goals and Sustainable Prosperity Act requires the province to reduce GHG emissions to a point at least 10 per cent below 1990 levels by 2020. The Climate Change Action Plan and the Department of Energy's 2009 Energy Strategy are the tools by which the province will achieve that goal.

Short-term actions, to be implemented by 2013, include the following:

- caps on Nova Scotia Power Inc.'s GHG emissions by 2010
- the 2013 Renewable Energy Standard, which will require NSPI to add new renewable energy sources by the end of that same year
- requiring NSPI to allow greater use of two-way meters (net metering), which encourage small producers of clean energy
- starting to upgrade the Nova Scotia electrical transmission system to permit greater use of renewable energy
- improvements to the energy efficiency of new and existing homes and buildings

- conversions to natural gas
- new transportation policies

Medium-term actions, to be implemented after 2013, include the following:

- 2015 and 2020 GHG caps for NSPI
- upgrading Nova Scotia's electrical transmission grid to permit stronger connections with neighbouring provinces
- ensuring that at least 25 per cent of our electricity is generated from renewable energy sources by 2020
- possible importation of clean power from other provinces
- new technologies, such as ways to capture carbon produced by coal-fired plants before it is released to the air in GHGs
- reducing GHGs from other energy sources

The 2020 target will require reductions of at least five megatonnes per year.

Long-term actions, to be implemented after 2020:

> We need to position ourselves for even greater reductions—up to 80 per cent by 2050.
>
> It is difficult to predict how we will achieve targets we may have to meet after 2020, but there is a precedent for setting important environmental goals without certainty on how they will be reached. In 1963, the United States Congress passed the Clean Air Act, setting stringent limits for automobile exhaust. At the time, industry and environmental groups alike predicted that the automobile industry would be unable to meet the targets. Researchers later invented the catalytic converter, and the targets were exceeded.

GETTING TO 2020

Nova Scotia's 2009 Energy Strategy and its Climate Change Action Plan are closely linked in a shared goal of reducing greenhouse gas (GHG) emissions to at least 10 per cent below 1990 levels by 2020. This 2020 goal translates to at least 5 megatonnes (MT) of GHG reduction per year.

ACTION	Estimated GHG Reduction
ENERGY EFFICIENCY/CONSERVATION	
• improvements to existing houses and buildings	1.7–3.0 MT
• natural gas conversions	
• new building standards	
• transportation efficiencies	
RENEWABLES AND AIR QUALITY	
• 2013 Renewable Energy Standard regulation	0.8–1.1 MT
• expanded net metering	
• air quality regulations	
FUTURE CLEANER ENERGY ACTIONS	
• post-2013 renewable energy	2.5–3.4 MT
• clean energy imports	
• cleaner energy options (e.g., natural gas, co-generation)	
• NSPI GHG emissions caps and enhanced air quality regulations	
TOTAL 2020	**5–7.5 MT**

ADAPTING TO A CHANGING CLIMATE

There's a lag between the buildup of GHGs in the atmosphere and the impact on climate. Even if we could halt all harmful emissions tomorrow, the impact of past emissions would be with us for some time.

In the 21st century, we can expect warmer average temperatures, rising sea levels, and more-frequent extreme storms. Nova Scotia is particularly susceptible to these changes because most of our population lives along the coast and much of our infrastructure is located in vulnerable areas and wasn't engineered to withstand a higher frequency of extreme weather. Important sectors of our economy like fishing, forestry, and tourism are climate sensitive.

As a result, the Climate Change Action Plan includes practical steps to prepare for and cope with climate changes that can't be averted.

Actions to be implemented by 2013 include:

- an adaptation fund to help Nova Scotia prepare for the effects of a changing climate: we need to better understand the climate future we face and what we can do to prepare for it
- incorporating climate change impacts and adaptation response plans into the strategies and plans of all provincial departments by 2012
- providing municipalities with guidance on land-use issues that cross municipal boundaries

AIR POLLUTANTS

The Climate Change Action Plan is closely integrated with the province's efforts to reduce air pollutants. GHG emissions and air pollution tend to come from the same sources, and managing one can affect our ability to manage the other.

The Environmental Goals and Sustainable Prosperity Act sets out these targets for air pollutants:

- Reduce nitrogen oxide emissions by 20 per cent (from 2000 levels) by 2009.
- Reduce sulphur dioxide emissions by 50 per cent (from sources existing in 2001) by 2010.
- Reduce mercury emissions by 70 per cent (from 2001 levels) by 2010.
- Meet the Canada-wide standard for airborne fine particulate matter by 2010.
- Meet the Canada-wide standard for ground-level ozone by 2010.

The province will set more-stringent emissions caps on nitrogen oxides and sulphur dioxide for 2015 and 2020.

IV. Climate Change Actions

Nova Scotia has already taken several steps to reduce GHGs and other air pollutants. In 2006, the province launched Conserve Nova Scotia, a government agency that helps Nova Scotians use energy more efficiently, thereby cutting fuel bills and reducing GHG emissions and air pollutants.

In 2007, the province created a Renewable Energy Standard. It requires Nova Scotia Power Inc. to generate an additional 10 per cent of its electricity, by 2013, from renewable sources created after 2001. This will raise the renewable portion of our electricity supply to a minimum of 18.5 per cent.

Also in 2007, with funding from the Government of Canada, Nova Scotia committed $42.5 million to establish ecoNova Scotia for Clean Air and Climate Change, a fund to support projects that reduce GHG emissions and air pollutants.

The Climate Change Action Plan brings these significant achievements together with 68 actions that focus on eight key areas: cleaner energy, energy efficiency, renewable energy, transportation, air quality, government leadership, public engagement and education, and adapting to climate change.

CLEANER ENERGY

Almost half of the province's GHG emissions come from the production of electricity, and about half of our GHG reductions will come from Nova Scotia Power Inc.

About 75 per cent of our electricity comes from burning coal, our dirtiest fuel. However, the province does not intend to prescribe which fuels NSPI must use in its business. What we will prescribe are the results. The Climate Change Action Plan will establish increasingly stringent limits on the amount of GHG and air pollutants the utility can emit. This will encourage NSPI to use all of the tools at its disposal—energy efficiency, renewable energy, and cleaner fuels—to achieve our sustainable prosperity goals.

THE PROVINCE WILL TAKE THE FOLLOWING ACTIONS:

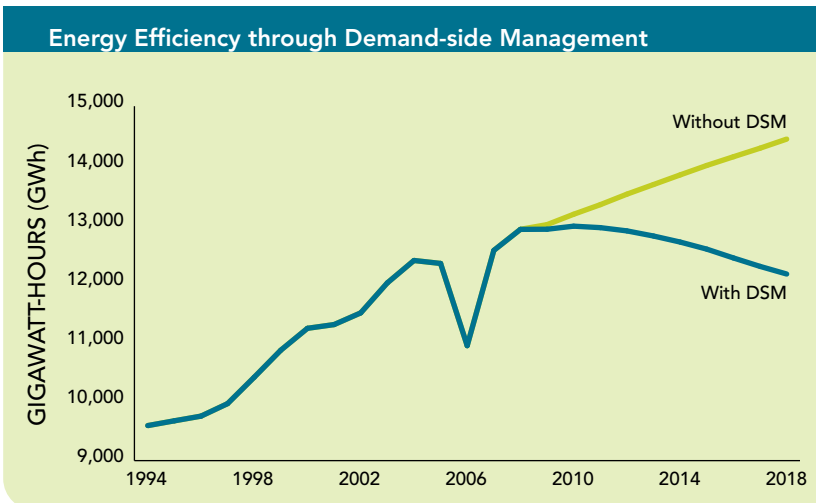
Action 1

Impose increasingly stringent absolute caps on NSPI's GHG emissions for 2010, 2015, and 2020.

Action 2

Target GHG and air pollutant emissions from sources other than coal-generated electricity, by working with stakeholders to develop policies and regulations.

Source: www.nspower.ca/documents/rate2009/SR%20Combined%20REDACTED.pdf



ENERGY EFFICIENCY

Nova Scotia now uses about 14 per cent more energy than it did in 1990. As a result, our GHG emissions have also risen. It is essential that we level off our energy consumption. The challenge is to do this while allowing our economy to grow. Energy efficiency and conservation are the best tools at our disposal. Projects that reduce energy consumption serve Nova Scotia's economic and environmental goals in three ways: they save money, they save energy, and they curb GHG production.

The province recently funded a study of ways to improve energy efficiency in Nova Scotia. The study found lots of potential for improving the efficiency of our use of all energy

sources, not just electricity. It identified commercial buildings as a particularly attractive target for investment in energy-saving programs. Last year's spike in energy prices underscored the need to improve the energy efficiency of our homes and vehicles as well.

The province supports a recent Utility and Review Board order requiring NSPI to spend ratepayer dollars on an electrical energy efficiency program called Demand-Side Management. Under this program, up to 5 per cent of Nova Scotia Power Inc.'s revenues will be spent on efficiency and conservation measures. It is predicted that by 2018, ratepayers could be saving 2,300 gigawatt-hours (GWh) of electricity per year. That's like eliminating—or not having to build—a 400-megawatt coal-fired generating plant. By comparison, NSPI's total generating capacity is about 2,300 megawatts.

Some energy conservation measures—things like walking to work, taking the bus, or switching to more-efficient compact fluorescent light bulbs—require little or no investment. Other steps—like buying a new appliance or an energy-efficient furnace—require a large outlay before any savings are achieved.

Many individuals and companies don't have the money to pay for such purchases. This is an area where government can help. By subsidizing the upfront costs of investments in energy efficiency, it can help achieve energy savings more quickly. Government can also move the process along by implementing regulations that require new buildings and vehicles to be more efficient. Education programs can help all of us make the right choices for the environment.

THE PROVINCE WILL TAKE THE FOLLOWING ACTIONS:

Action 3

Create a new, independent administrator for the electrical efficiency program established by the Utility and Review Board.

Action 4

Commit to increasing overall energy efficiency in the province by 20 per cent over

2008 levels by 2020, and strive to implement all cost-effective steps toward energy efficiency.

Action 5

Expand energy efficiency and conservation programs for homeowners and businesses, and develop new ones. Spending in the current fiscal year will exceed $17 million.

Action 6

Study rate structures and metering systems that encourage electricity conservation and efficiency, beginning in 2009, to see what will work best in Nova Scotia.

Action 7

Create a Chair in Farm Energy Conservation at the Nova Scotia Agricultural College.

Commercial buildings

Action 8

Effective in 2011, amend the Nova Scotia Building Code Act to require all new commercial buildings of more than 600 m^2 to exceed the 1997 Model National Energy Code for Buildings by at least 25 per cent, or to adopt the updated version of the 1997 Model National Energy Code for Buildings expected in 2011. This is only a start. The province will work with its partners to strengthen standards on a continuing basis as innovative and cost-effective technologies come to the market.

Residential buildings

Action 9

Require, by December 31, 2009, all new residential dwellings, and all commercial buildings under 600 m^2, to meet prescriptive or performance requirements that are equivalent to an EnerGuide for New Homes rating of 80 under the Nova Scotia Building Code Act.

Action 10

Require low-flush toilets and permit the use of water-free technologies and the re-use of grey water by December 31, 2009, under the Nova Scotia Building Code Act.

Appliances

Action 11

Implement stricter energy-efficiency regulations for appliances. The new rules, which will also increase the number of appliance categories that are regulated, will be updated every three years to the highest regulatory standards.

RENEWABLE ENERGY

Improving energy efficiency is our quickest route to reduced GHG and air pollutant emissions. The next most effective step is to use a lot more renewable energy, something that will also promote a healthier environment and a more competitive economy. Right now, about 88 per cent of our electricity comes from fossil fuels. This has to change.

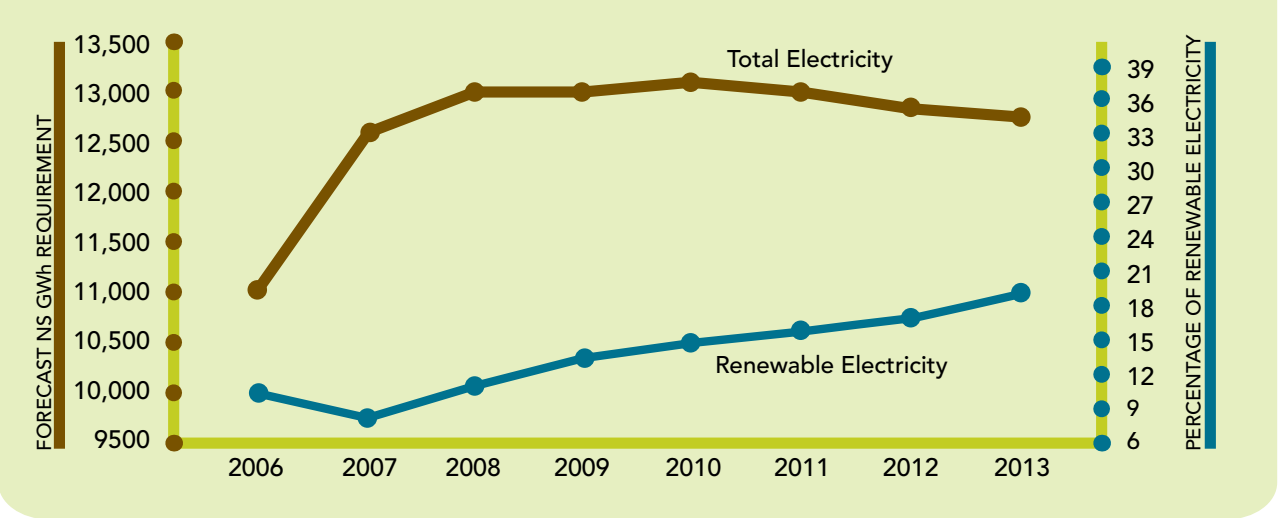
Fortunately, there's lots of potential for growth in our renewable energy sources. Nova Scotia has an abundance of wind energy, and the technology for capturing it is rapidly maturing. We have some of the highest tides in the world, positioning us to be a leader in the emerging technology of generating power from the tides.

As noted, the province's Renewable Energy Standard requires Nova Scotia Power Inc. to generate an additional 10 per cent of its electricity, by 2013, from new renewable sources created after 2001. This brings the total to a minimum of 18.5 per cent. The province's wind integration study in 2007 concluded that, with some operational management, this target could be met. To ramp up our renewable energy use after 2013, big investments will be needed in our electricity grid. We also need to determine the most effective means to increase the grid's ability to handle additional intermittent resources after 2013.

The need for grid enhancements arises from the fact that the sun, the wind, and the tide only provide energy when the sun shines, the wind blows, or the tide flows. We can't call them up whenever we need them, only when nature chooses to provide them. That means we need backup power we can draw on when renewable supplies are unavailable.

One possibility is to draw on sources of baseload power outside the province. Right now, in terms of electricity, Nova Scotia is all but an island. We have only a slender 350-megawatt connection with New Brunswick. By contrast, New Brunswick enjoys 1400 megawatts of interconnection with Quebec, Ontario, and New England.

Renewable Energy Standard Growth in NS.



We need a more-robust connection to our neighbouring provinces, so we can sell them clean energy when we have a surplus and call on their clean energy supplies when needed. We also need more capacity to move electricity around Nova Scotia, so that if the wind is blowing in Digby but not Lingan, we can move power from one place to another.

Once we know more about our options for storage, transmission upgrades, and backup supplies, we will develop new policies that require more electricity to come from renewable energy sources. We will make two-way metering more

attractive to encourage small-scale local renewable energy projects. We will work with our counterparts in eastern Canada and New England to create more-robust interconnections, so clean power can be shared regionally.

THE PROVINCE WILL TAKE THE FOLLOWING ACTIONS:

Action 12

Produce the 2009 Energy Strategy, a companion piece to this document. Developed by the Department of Energy, it will lead the transformation of Nova Scotia's electricity system to achieve a green energy future where at least 25 per cent of our electricity needs will come from renewable energy sources by 2020.

Action 13

Begin studies on regional electricity integration, known as the Green Grid Initiative, to diversify our energy sources. These studies, led by the Department of Energy, will begin in 2009.

Action 14

Armed with the better understanding of costs and capacity that will result from Action 13, require greater use of renewable energy after 2013.

Action 15

Develop regulations to allow greater use of two-way electric meters after 2009. Two-way meters (net metering) let small producers of intermittent renewable power transmit electricity to NSPI when their generators are operating and receive power from the grid when they are not.

Action 16

Develop a bio-resource strategy by 2011 to determine the best potential uses and the best policies to encourage the use of bio-energy–based fuels. The strategy will take account of GHGs and other air emissions produced throughout the life cycle of various bio-fuels.

Action 17

To support the development of biomass for electrical generation, provide the forest industry with funds from the Community Development Trust to study the feasibility of potential biomass generation projects.

Action 18

To support development of other uses for forest biomass, provide funds from the Community Development Trust to improve our understanding of forest biomass availability and the potential of forest biomass projects to improve site productivity.

TRANSPORTATION

Transportation produces roughly one quarter of the Nova Scotia's GHG emissions. The Climate Change Action Plan focuses on three aspects of transportation:

- increasing the efficiency of the vehicles we use
- encouraging alternative ways of getting around, such as walking, biking, and using public transit
- planning our communities to reduce the need for transportation

Increasing vehicle efficiency is a goal shared by many states and provinces. As a result, cars will get much better fuel economy in the coming years.

Developing new ways of getting around, and reducing the need for transportation in our very rural province, pose much greater challenges. To tackle this problem, we need to ask some hard questions: Are Nova Scotians willing to move closer to work or public transportation? What can we do about communities without public transportation? How can we redesign communities to minimize the need for transportation? Can more-efficient urban layouts for our towns and cities be encouraged by rezoning? What are the appropriate roles for the province and for municipalities?

THE PROVINCE WILL TAKE THE FOLLOWING ACTIONS:

Action 19

Produce a Sustainable Transportation Strategy by 2010 that will build on existing work. A task force headed by Transportation and Infrastructure Renewal, with members from Conserve Nova Scotia, Service Nova Scotia and Municipal Relations, Nova Scotia Environment, and municipal governments, will consult with the public and interested groups. The task force, to be created by March 31, 2009, will consider all aspects of transportation, including public transit, active transportation, funding, and land-use planning.

Action 20

While the Nova Scotia Sustainable Transportation Strategy is being developed, continue to fund public and alternative transportation and expand innovative transportation projects.

Action 21

Following consultation and co-operation with other jurisdictions, introduce regulations by 2010 setting fuel consumption and emissions standards for new vehicles.

Action 22

Develop a program in 2009 to encourage—and support—consumers to choose greener cars and trucks that are more fuel efficient and produce less air pollution.

Action 23

Review the province's park-and-ride lots with the intention of increasing their capacity. There are now about 30 park-and-ride lots at intersections of major highways.

Action 24

Over the next five years, expand the weigh-in-motion program at scale houses throughout the province. These systems save idling time by reducing stops and starts for heavy trucks. The first such system has already been installed at the Canso Causeway.

Action 25

Begin a pilot project to allow double 53-foot semi-trailers to be hauled by a single tractor on four-lane, divided highways between Halifax and the New Brunswick border at speeds of 90 km/h or slower. These trucks reduce emissions and save fuel by allowing one engine to haul two loads.

Action 26

Develop an anti-idling policy for government vehicles and employee vehicles on government business by 2009. A model anti-idling bylaw for use by municipalities will also be developed.

Action 27

Introduce a pilot project to provide incentives for equipment that will improve the energy efficiency of heavy truck fleets and encourage the use of efficient light-duty vehicles in commercial fleets, such as taxis.

AIR QUALITY

The emission of GHGs often goes hand in hand with the production of such health-damaging emissions as sulphur dioxide, nitrogen oxides, volatile organic compounds, airborne particles, and mercury. Efforts to reduce one type of harmful emission can sometimes increase production of another.

The 2001 Energy Strategy included a series of measures aimed at reducing harmful air emissions from our largest emitters. These included curbs on sulphur dioxide, nitrogen oxides, and mercury emissions. Production of these pollutants in Nova Scotia is much lower today than it was a decade ago. The Climate Change Action Plan builds on these improvements.

The Climate Change Action Plan aims to ensure that we move forward on all fronts simultaneously. It takes what's known as an airshed approach that considers the cumulative effect of diverse sources of pollution on the air over Nova Scotia.

Acid rain

The burning of fossil fuels creates sulphur dioxide (SO_2) and nitrogen oxides (NO_x), which mix with water in the air to form acid rain or snow. Acid precipitation reduces forest growth and damages or destroys life in our lakes and rivers. Nova Scotia has a low tolerance for acid precipitation because many of our fresh lakes, streams, and soils have little ability to neutralize the acid deposits. This is especially true in southwestern Nova Scotia.

Despite progress in cutting SO_2 and NO_x emissions, Nova Scotia continues to exceed critical loads—the amount of acid precipitation the environment can receive before lasting damage occurs.

Smog

Smog is a mixture of ground-level ozone (O_3) and airborne particles with a diameter of less than 2.5 microns (known as fine particulate matter or $PM_{2.5}$). Sulphur dioxide, nitrogen oxides, and other pollutants caused by the burning of fossil fuels contribute to the creation of smog through complex chemical interactions.

Smog aggravates heart and lung conditions, especially in young children and the elderly. This is of special concern to Nova Scotians, because we have some of the highest rates of asthma and heart disease in Canada. Smog can also harm vegetation, forestry, crops, and many materials used in buildings.

THE PROVINCE WILL TAKE THE FOLLOWING ACTIONS:

Action 28

Use an airshed approach to manage Nova Scotia's air quality, and consider the combined impact of local and out-of-province emissions. Nova Scotia Environment will lead this effort. The province will work with industry, and others, to reduce local emissions, and with the Canadian government and other provinces to curb out-of-province pollution.

Action 29

To give Nova Scotians better information about the quality of our air, continue its long-term air monitoring and begin to implement the Air Quality Health Index. The system will produce up-to-the-hour information about air quality.

Sulphur dioxide (SO_2)

Action 30

In addition to the cap already in place for 2010, set new, tighter limits on NSPI's sulphur dioxide emissions for 2015 and 2020.

Action 31

Assess the effectiveness of our sulphur reduction efforts by 2011.

Nitrogen oxides (NO_x)

Action 32

In addition to the cap already in place for 2009, set new, tighter limits on NSPI's nitrogen oxide emissions for 2015 and 2020.

Action 33

Continue to require that all utility and industrial boilers install low-NO_x burner technology during upgrades. A clearer definition of "low-NO_x" will strengthen this requirement.

Particulate matter and ozone

Particulate matter is a technical term for tiny airborne particles. Fine particulate matter combines with ozone to create smog.

Action 34

Complete its plan for complying with the Canada-wide standard for particulate matter and ground-level ozone by the end of 2009.

Mercury
Methylmercury is a toxin that accumulates in the food chain. It damages nerve tissue and is particularly harmful to young children. With the other provinces and the Government of Canada, Nova Scotia participated in the development of a new Canada-wide standard for mercury emissions from coal-fired power plants. The Environmental Goals and Sustainable Prosperity Act set limits on mercury emissions to take effect in 2010.

Action 35

Achieve the 2010 cap on mercury emissions, and comply with further strengthening of the Canada-wide standard for mercury emissions. These efforts may include capturing 80 per cent or more of the emissions from coal-fired plants by 2018.

LEADERSHIP BY EXAMPLE

The provincial government is the largest consumer in Nova Scotia. The province buys more than $800-million worth of goods and services every year—even more when municipalities, agencies, schools, and hospitals are included.

The province owns and operates more than 3,000 buildings, owns 12,000 rental units, and holds approximately 230 leases. These properties comprise about 1.5 million square feet throughout the province. The province owns and leases more than 2,500 vehicles.

As such a large consumer, the province can demand goods and services that meet our climate change and sustainable prosperity objectives. For example, the province can require that our leased spaces, cars, and computers be energy efficient and minimize waste.

The province can also use its market power to foster new technologies and solutions. For example, to fulfil Action 39 below, the province could aim to construct a building so efficient that it needs no net energy and produces no net carbon emissions—a so-called net-zero carbon and energy building.

THE PROVINCE WILL TAKE THE FOLLOWING ACTIONS:

Action 36

By the end of 2009, include an assessment of greenhouse gas and air pollutant emissions as part of a "green filter" applied to projects requiring government approval.

Provincial government buildings

Action 37

Require that all new government-owned buildings achieve LEED Silver certification after 2008; achieve LEED Gold certification or equivalent after 2010; and be carbon-neutral after 2020. The Leadership in Energy and Environmental Design (LEED) Green Building Rating System is a widely used set of standards for sustainable construction.

Action 38

Require any organization seeking government funds for building projects to adopt the LEED Silver standard, or an acceptable equivalent, for energy efficiency and water consumption.

Action 39

By 2015, construct a building that demonstrates a leading standard for energy efficiency and sustainability.

Action 40

Achieve an overall 30 per cent reduction by 2020 in energy consumption for all government-owned buildings constructed before 2001.

Action 41

In support of Action 40, begin a program in 2009 to achieve BOMA BESt * certification, or equivalent, for all of the Department of Transportation and Infrastructure Renewal's major owned and operated buildings by 2015.

* Building Owners and Managers Association of Canada–Building Environmental Standards

Provincial government vehicles

Action 42

Demonstrate leadership and a commitment to sustainable prosperity by choosing vehicles that are fuel efficient and environmentally responsible after 2008. A policy guiding this commitment will apply to certain types of vehicles and will result in the acquisition by lease or purchase of vehicles in the top 20 per cent of their class for energy efficiency and GHG and air pollutant emissions.

Action 43

Expand the E-Pass employee bus pass program as quickly as possible to all government employees.

Office equipment

Action 44

As part of a broader sustainable procurement policy being developed by 2009, require that all new information and communications equipment bought or leased by the province have Electronic Product Environmental Assessment Tool (EPEAT) silver certification or equivalent. Where EPEAT criteria have not been developed, equipment must meet the applicable ENERGY STAR standard.

ENGAGEMENT AND EDUCATION

The province will work with municipalities, communities, industries, businesses, non-profit groups, and the Government of Canada.

Education will be a major focus. Citizens need information and insight to make the right decisions. This doesn't mean telling people what to do, but giving them the knowledge and tools to make their own sustainable choices.

Our schools must continue to educate about climate change, a cleaner environment, and sustainable prosperity, so future generations can better cope with these issues.

Communities need to understand climate change so they can prepare for expected changes. Farmers need to understand how new weather conditions will affect their choice of crops and farm practices. Builders need to consider rising sea levels and extreme weather events in planning developments.

THE PROVINCE WILL TAKE THE FOLLOWING ACTIONS:

Municipalities

Action 45

Using funds from the federal Gas Tax Agreement continue to fund a sustainability coordinator for the Union of Nova Scotia Municipalities.

Action 46

Using funds from the federal Gas Tax Agreement provide funding in 2009 to help municipal governments plan for climate change. A key focus will be the impacts of sea-level rise on land-use planning and on the design of wastewater treatment plants.

Action 47

In 2009, work with the Union of Nova Scotia Municipalities on a memorandum of understanding that will address climate change mitigation and adaptation.

Action 48

Amend funding agreements with municipalities by 2010 to require climate change strategies in municipal Integrated Community Sustainability Plans.

Government of Canada

Action 49

Encourage the Government of Canada to support further GHG and air pollutant reductions by funding programs like ecoNova Scotia II and the Greening the Grid project to upgrade transmission capacity. The ecoNova Scotia fund for Clean Air and

Climate Change, which currently supports innovative projects that reduce emissions, is in place only until March 2011.

Action 50

Participate in national and international discussions on climate change and clean air, including those taking a North American approach. This will continue to include participation in the Canadian Council of Ministers of the Environment, the Council of Atlantic Environment Ministers, and the Conference of New England Governors and Eastern Canadian Premiers. Nova Scotia will seek observer status at discussions of the Western Climate Initiative.

Citizens

Action 51

Embark on a public awareness and education program, led by Nova Scotia Environment, to give citizens the knowledge and insight to lead more sustainable lifestyles.

Action 52

Incorporate climate change, sustainability, and complex decision making into the school curriculum. This builds on learning and teaching of these concepts that is already integrated into the curriculum.

ADAPTING TO CLIMATE CHANGE

The United Nations' Intergovernmental Panel on Climate Change (IPCC) concluded that global warming is "unequivocal." Climate changes are already occurring—in some cases more rapidly than scientists projected in the IPCC reports.

In Nova Scotia, we can expect warmer average temperatures, higher sea levels, more extreme rainfalls and storm flooding, and more-frequent and extreme storms.

Some native plants and animals might be unable to survive our new climatic

conditions. Higher water temperatures may render marine animals such as salmon, capelin, and cod increasingly vulnerable to competitors and parasites.

Nova Scotia's supplies of fresh water may be at greater risk of salt contamination from rising sea levels, pollution from runoff caused by heavy rains and snow, and parasites drawn to warmer water temperatures. We can expect increased demand for water and increased competition for it.

The old and the very young are vulnerable to the health effects of air pollution and heat waves. All Nova Scotians will be at greater risk of accidents, injuries, and deaths resulting from extreme weather.

The climate news isn't all bad. Warmer conditions may present opportunities for industries such as tourism and agriculture. But industries that benefit in some areas will have to manage new challenges—securing water supplies, managing pests, preserving heritage sites from weather damage and erosion—in others.

Preparing for a changing climate poses particular challenges in Nova Scotia because most of our population lives along the coastline and much of our infrastructure is located in vulnerable areas. In many cases, that infrastructure was designed to withstand weather events less extreme and less frequent than what we now expect.

We don't know for sure how extreme our weather will be. We need research to better understand the impact of climate change on Nova Scotia. But even with that uncertainty, we have enough information to begin preparing for climate change now.

Many players will be responsible for adapting to climate change, including: the provincial government, municipal governments, the government of Canada, private industry, as well as communities and individuals throughout Nova Scotia.

THE PROVINCE WILL TAKE THE FOLLOWING ACTIONS:

Action 53
Create an Adaptation Fund within Nova Scotia Environment to encourage adaptation research and development starting in 2009.

Action 54
Develop statements of provincial interest on adaptation by 2010 to provide guidance on land-use planning. This is a formal tool, established under the Municipal Government Act, to protect the province's interest in such areas as land use, water resources, and community planning.

Action 55
Incorporate climate change impacts and adaptation response plans into the strategies and initiatives of all provincial departments by 2012.

Action 56
Establish criteria in 2009 for the consideration of climate change during Nova Scotia Environment's environmental assessment process and develop a guide to climate change for project proponents.

Action 57
Launch a web-based clearinghouse of information and tools to support adaptation to climate change in Nova Scotia in 2009.

Action 58
Begin work on a provincial vulnerability assessment and progress report on adaptation to climate change in Nova Scotia. This report, which will be updated biannually, will provide updates on the latest climate research, review critical information gaps, and provide policy direction for the province.

Action 59
Continue to work with the other Atlantic provinces on common adaptation goals.

Action 60
Create an interdepartmental steering committee and external advisory committee responsible for coordinating adaptation efforts and providing adaptation policy advice, in 2009.

Action 61
Ensure that design standards and plans for new provincial construction, and for the renewal of existing provincial infrastructure, reflect projected climate trends, not historical records, by 2010.

Action 62
Release a Sustainable Coastal Development Strategy by 2010. A major part of the strategy will focus on strengthening our resiliency to climate change impacts along our coast.

Action 63
Take sea-level rise into consideration and place priority on conserving coastal wetlands in preparing a policy to prevent net loss of wetlands. The Environmental Goals and Sustainable Prosperity Act requires that this policy be developed by 2009.

Action 64
Develop a strategy to ensure the sustainability of the province's natural capital in forests (forestry), minerals (mining), parks, and biodiversity by 2010. This strategy will be led by the Department of Natural Resources.

Action 65
Develop a comprehensive water resource management strategy by 2010. As a key priority, the strategy will consider climate change impacts on water quality and quantity.

Action 66

Lead, through the Department of Natural Resources, an interdepartmental and forest industry working group on forest carbon management and forest adaptation to climate change.

MEASUREMENT AND ACCOUNTABILITY

Our ability to measure progress and hold someone accountable is key to a project as large and significant as the Climate Change Action Plan. Fortunately, there are a number of generally accepted methods for tracking GHG emissions, and Nova Scotia already has an accountability mechanism.

THE PROVINCE WILL TAKE THE FOLLOWING ACTIONS:

Action 67

With advice from the Nova Scotia Round Table on Environment and Sustainable Prosperity, assess progress toward meeting our GHG reduction target as part of the Environmental Goals and Sustainable Prosperity Act annual progress report. The effectiveness of the target will be assessed every five years through a public review by the Round Table.

Action 68

Establish a Climate Change Directorate within Nova Scotia Environment. This office will work with provincial departments and municipalities, agencies, schools, and hospitals to reduce GHG emissions and ensure that effective adaptation measures are being implemented.

V. Conclusion

The Climate Change Action Plan and Nova Scotia's 2009 Energy Strategy are not "business as usual." They set out important steps in bringing sustainable prosperity to Nova Scotia's economy and environment.

Nova Scotia aims to reduce its GHG production to at least 10 per cent below 1990 levels by 2020. That's a reduction of more than 20 per cent compared to our current levels, and even more compared to where we would be in 2020 if we continued with our current habits.

In 2020, our province and our population will be better off: our efforts will have reduced the threat from climate change, our air will be healthier, and our energy supply will be more predictable, more stable, and quite likely more affordable than it would otherwise be. So, rather than make sacrifices, we will make changes, individually and as a community.

And this is something we have shown we can do. Our decision to dramatically reduce the amount of waste we send to landfills is the best example. The arrival of green bins at our homes and the need to sort our waste before taking it to the curb were enormous changes to our daily routines. But now we don't even think about it. This kind of stewardship has become second nature for Nova Scotians, and nobody in Canada does it better.

We believe other changes will become second nature to Nova Scotians as we follow through on the Climate Change Action Plan. We'll make different choices in lighting and electrical appliances. We'll plan our errands and work lives to eliminate unnecessary car trips. When we can, we'll walk or ride a bike. And the toughest questions car dealers will face from us will be about fuel efficiency and emissions.

The Climate Change Action Plan contains targets that, by conventional wisdom, will prove to be a daunting challenge. But conventional wisdom ignores the potential of a motivated community. We believe in that potential. We believe that once Nova Scotians get behind the Climate Change Action Plan, its targets will some day be seen as mere milestones on the way to even greater achievements.

Appendix: Climate Change Actions

Cleaner Energy

The province will take the following actions:

Action 1

Impose increasingly stringent absolute caps on NSPI's GHG emissions for 2010, 2015, and 2020.

Action 2

Target GHG and air pollutant emissions from sources other than coal-generated electricity, by working with stakeholders to develop policies and regulations.

Energy Efficiency

The province will take the following actions:

Action 3

Create a new, independent administrator for the electrical efficiency program established by the Utility and Review Board.

Action 4

Commit to increasing overall energy efficiency in the province by 20 per cent over 2008 levels by 2020, and strive to implement all cost-effective steps toward energy efficiency.

Action 5

Expand energy efficiency and conservation programs for homeowners and businesses, and develop new ones. Spending in the current fiscal year will exceed $17 million.

Action 6

Study rate structures and metering systems that encourage electricity conservation and efficiency, beginning in 2009, to see what will work best in Nova Scotia.

Action 7

Create a Chair in Farm Energy Conservation at the Nova Scotia Agricultural College.

Commercial buildings

Action 8

Effective in 2011, amend the Nova Scotia Building Code Act to require all new commercial buildings of more than 600 m^2 to exceed the 1997 Model National Energy Code for Buildings by at least 25 per cent, or to adopt the updated version of the 1997 Model National Energy Code for Buildings expected in 2011. This is only a start. The province will work with its partners to strengthen standards on a continuing basis as innovative and cost-effective technologies come to the market.

Residential buildings

Action 9

Require, by December 31, 2009, all new residential dwellings, and all commercial buildings under 600 m^2, to meet prescriptive or performance requirements that are equivalent to an EnerGuide for New Homes rating of 80 under the Nova Scotia Building Code Act.

Action 10

Require low-flush toilets, and permit the use of water-free technologies and the re-use of grey water by December 31, 2009 under the Nova Scotia Building Code Act.

Appliances

Action 11

Implement stricter energy-efficiency regulations for appliances. The new rules, which will also increase the number of appliance categories that are regulated, will be updated every three years to the highest regulatory standards.

Renewable Energy

The province will take the following actions:

Action 12

Produce the 2009 Energy Strategy, a companion piece to this document. Developed by the Department of Energy, it will lead the transformation of Nova Scotia's electricity system to achieve a green energy future where at least 25 per cent of our electricity needs will come from renewable energy sources by 2020.

Action 13

Begin studies on regional electricity integration, known as the Green Grid Initiative, to diversify our energy sources. These studies, led by the Department of Energy, will begin in 2009.

Action 14

Armed with the better understanding of costs and capacity that will result from Action 13, require greater use of renewable energy after 2013.

Action 15

Develop regulations to allow greater use of two-way electric meters after 2009. Two-way meters (net metering) let small producers of intermittent renewable power transmit electricity to NSPI when their generators are operating and receive power from the grid when they are not.

Action 16

Develop a bio-resource strategy by 2011 to determine the best potential uses and the best policies to encourage the use of bio-energy–based fuels. The strategy will take account of GHGs and other air emissions produced throughout the life cycle of various bio-fuels.

Action 17

To support development of biomass for electrical generation, provide the forest industry with funds from the Community Development Trust to study the feasibility of potential biomass generation projects.

Action 18

To support development of other uses for forest biomass, provide funds from the Community Development Trust to improve our understanding of forest biomass availability and the potential of forest biomass projects to improve site productivity.

Transportation

The province will take the following actions:

Action 19

Produce a Sustainable Transportation Strategy by 2010 that will build on existing work. A task force headed by Transportation and Infrastructure Renewal, with members from Conserve Nova Scotia, Service Nova Scotia and Municipal Relations, Nova Scotia Environment, and municipal governments, will consult with the public and interested groups. The task force, to be created by March 31, 2009, will consider all aspects of transportation, including public transit, active transportation, funding, and land-use planning.

Action 20

While the Nova Scotia Sustainable Transportation Strategy is being developed, continue to fund public and alternative transportation and expand innovative transportation projects.

Action 21

Following consultation and co-operation with other jurisdictions, introduce regulations by 2010 setting fuel consumption and emissions standards for new vehicles.

Action 22
Develop a program in 2009 to encourage—and support—consumers to choose greener cars and trucks that are more fuel efficient and produce less air pollution.

Action 23
Review the province's park-and-ride lots with the intention of increasing their capacity. There are now about 30 park-and-ride lots at intersections of major highways.

Action 24
Over the next five years, expand the weigh-in-motion program at scale houses throughout the province. These systems save idling time by reducing stops and starts for heavy trucks. The first such system has already been installed at the Canso Causeway.

Action 25
Begin a pilot project to allow double 53-foot semi-trailers to be hauled by a single tractor on four-lane, divided highways between Halifax and the New Brunswick border at speeds of 90 km/h or slower. These trucks reduce emissions and save fuel by allowing one engine to haul two loads.

Action 26
Develop an anti-idling policy for government vehicles and employee vehicles on government business by 2009. A model anti-idling bylaw for use by municipalities will also be developed.

Action 27
Introduce a pilot project to provide incentives for equipment that will improve the energy efficiency of heavy truck fleets and encourage the use of efficient light-duty vehicles in commercial fleets, such as taxis.

Air Quality
The province will take the following actions:

Smog

Action 28
Use an airshed approach to manage Nova Scotia's air quality, and consider the combined impact of local and out-of-province emissions. Nova Scotia Environment will lead this effort. The province will work with industry, and others, to reduce local emissions, and with the Canadian government and other provinces to curb out-of-province pollution.

Action 29
To give Nova Scotians better information about the quality of our air, continue its long-term air monitoring and begin to implement the Air Quality Health Index. The system will produce up-to-the-hour information about air quality.

Sulphur dioxide (SO_2)

Action 30
In addition to the cap already in place for 2010, set new, tighter limits on NSPI's sulphur dioxide emissions for 2015 and 2020.

Action 31
Assess the effectiveness of our sulphur reduction efforts by 2011.

Nitrogen oxides (NOx)

Action 32
In addition to the cap already in place for 2009, set new, tighter limits on NSPI's nitrogen oxide emissions for 2015, and 2020.

Action 33

Continue to require that all utility and industrial boilers install low-NO_X burner technology during upgrades. A clearer definition of "low-NO_X" will strengthen this requirement.

Particulate matter and ozone

Action 34

Complete its plan for complying with the Canada-wide standard for particulate matter and ground-level ozone by the end of 2009.

Mercury

Action 35

Achieve the 2010 cap on mercury emissions, and comply with further strengthening of the Canada-wide standard for mercury emissions. These efforts may include capturing 80 per cent or more of the emissions from coal-fired plants by 2018.

Leadership by Example

The province will take the following actions:

Action 36

By the end of 2009, include an assessment of greenhouse gas and air pollutant emissions as part of a "green filter" applied to projects requiring government approval.

Provincial Government Buildings

Action 37

Require that all new government-owned buildings achieve LEED Silver certification after 2008; achieve LEED Gold certification or equivalent after 2010; and be carbon-neutral after 2020. The Leadership in Energy and Environmental Design (LEED) Green Building Rating System is a widely used set of standards for sustainable construction.

Action 38

Require any organization seeking government funds for building projects to adopt the LEED Silver standard, or an acceptable equivalent, for energy efficiency and water consumption.

Action 39

By 2015, construct a building that demonstrates a leading standard for energy efficiency and sustainability.

Action 40

Achieve an overall 30 per cent reduction by 2020 in energy consumption for all government-owned buildings constructed before 2001.

Action 41

In support of Action 40, begin a program in 2009 to achieve BOMA BESt* certification, or equivalent, for all of the Department of Transportation and Infrastructure Renewal's major owned and operated buildings by 2015.

Provincial government vehicles

Action 42

Demonstrate leadership and a commitment to sustainable prosperity by choosing vehicles that are fuel efficient and environmentally responsible after 2008. A policy guiding this commitment will apply to certain types of vehicles and will result in the acquisition by lease or purchase of vehicles in the top 20 per cent of their class for energy efficiency and GHG and air pollutant emissions.

* Building Owners and Managers Association of Canada–Building Environmental Standards

Action 43
Expand the E- Pass employee bus pass program as quickly as possible to all government employees.

Office equipment

Action 44
As part of a broader sustainable procurement policy being developed by 2009, require that all new information and communications equipment bought or leased by the province have Electronic Product Environmental Assessment Tool (EPEAT) silver certification or equivalent. Where EPEAT criteria have not been developed, equipment must meet the applicable ENERGY STAR standard.

Engagement and Education
The province will take the following actions:

Municipalities

Action 45
Using funds from the federal Gas Tax Agreement continue to fund a sustainability coordinator for the Union of Nova Scotia Municipalities.

Action 46
Using funds from the federal Gas Tax Agreement, provide funding in 2009 to help municipal governments plan for climate change. A key focus will be the impacts of sea-level rise on land-use planning and on the design of wastewater treatment plants.

Action 47
In 2009, work with the Union of Nova Scotia Municipalities on a memorandum of understanding that will address climate change mitigation and adaptation.

Action 48
Amend funding agreements with municipalities by 2010 to require climate change strategies in municipal Integrated Community Sustainability Plans.

Government of Canada

Action 49
Encourage the Government of Canada to support further GHG and air pollutant reductions by funding programs like ecoNova Scotia II and the Greening the Grid project to upgrade transmission capacity. The ecoNova Scotia fund for Clean Air and Climate Change, which currently supports innovative projects that reduce emissions, is in place only until March 2011.

Action 50
Participate in national and international discussions on climate change and clean air, including those taking a North American approach. This will continue to include participation in the Canadian Council of Ministers of the Environment, the Council of Atlantic Environment Ministers, and the Conference of New England Governors and Eastern Canadian Premiers. Nova Scotia will seek observer status at discussions of the Western Climate Initiative.

Citizens

Action 51
Embark on a public awareness and education program, led by Nova Scotia Environment, to give citizens the knowledge and insight to lead more sustainable lifestyles.

Action 52
Incorporate climate change, sustainability, and complex decision making into the school curriculum. This builds on learning and teaching of these concepts that is already integrated into the curriculum.

Adapting to Climate Change

The province will take the following actions:

Action 53

Create an Adaptation Fund within Nova Scotia Environment to encourage adaptation research and development starting in 2009.

Action 54

Develop statements of provincial interest on adaptation by 2010 to provide guidance on land-use planning. This is a formal tool, established under the Municipal Government Act, to protect the province's interest in such areas as land use, water resources, and community planning.

Action 55

Incorporate climate change impacts and adaptation response plans into the strategies and initiatives of all provincial departments by 2012.

Action 56

Establish criteria in 2009 for the consideration of climate change during Nova Scotia Environment's environmental assessment process and develop a guide to climate change for project proponents.

Action 57

Launch a web-based clearinghouse of information and tools to support adaptation to climate change in Nova Scotia in 2009.

Action 58

Begin work on a provincial vulnerability assessment and progress report on adaptation to climate change in Novas Scotia. This report, which will be updated biannually, will provide updates on the latest climate research, review critical information gaps, and provide policy direction for the province.

Action 59

Continue to work with the other Atlantic provinces on common adaptation goals.

Action 60

Create an interdepartmental steering committee and external advisory committee responsible for coordinating adaptation efforts and providing adaptation policy advice, in 2009.

Action 61

Ensure that design standards and plans for new provincial construction, and for the renewal of existing provincial infrastructure, reflect projected climate trends, not historical records, by 2010.

Action 62

Release a Sustainable Coastal Development Strategy by 2010. A major part of the strategy will focus on strengthening our resiliency to climate change impacts along our coast.

Action 63

Take sea-level rise into consideration and place priority on conserving coastal wetlands in preparing a policy to prevent net loss of wetlands. The Environmental Goals and Sustainable Prosperity Act requires that this policy be developed by 2009.

Action 64

Develop a strategy to ensure the sustainability of the province's natural capital in forests (forestry), minerals (mining), parks, and biodiversity by 2010. This strategy will be led by the Department of Natural Resources.

Action 65

Develop a comprehensive water resource management strategy by 2010. As a key priority, the strategy will

consider climate change impacts on water quality and quantity.

Action 66

Lead, through the Department of Natural Resources, an interdepartmental and forest industry working group on forest carbon management and forest adaptation to climate change.

Measurement and Accountability

The province will take the following actions:

Action 67

With advice from the Nova Scotia Round Table on Environment and Sustainable Prosperity, assess progress toward meeting our GHG reduction target as part of the Environmental Goals and Sustainable Prosperity Act annual progress report. The effectiveness of the target will be assessed every five years during a public review by the Round Table.

Action 68

Establish a Climate Change Directorate within Nova Scotia Environment. This office will work with provincial departments and municipalities, agencies, schools, and hospitals to reduce GHG emissions and ensure that effective adaptation measures are being implemented.

Acknowledgments

Many people and groups contributed to this plan. In November and December 2007, Dalhousie oceanographer Bob Fournier facilitated 13 public consultation workshops to obtain public comments on the province's Climate Change Action Plan and a companion project, the 2009 Energy Strategy. More than 250 people took part in workshops held across the province from Yarmouth to Cheticamp. Notes on these public consultation workshops are available on the Energy Department's website at www.gov.ns.ca/energy/energy-strategy.

Department staff also met with 19 companies and organizations with a particular interest in climate change. These included energy producers, major energy consumers, and environmental groups. The department also encouraged groups and individuals to make written submissions. We received 145 written comments. These, too, are available on the energy strategy website.

The use and production of energy are deeply ingrained in the way we live and work. Making adjustments on the scale required to head off climate change has far-reaching—and sometimes unexpected—consequences. To ensure that we have a firm grasp of the action plan's implications, representatives of 14 provincial departments—including Energy, Transportation and Infrastructure Renewal, Finance, Service Nova Scotia and Municipal Relations, Natural Resources, Fisheries and Aquaculture, and Economic Development—participated in our deliberations.

Nova Scotia Environment thanks all those who took part.

NOVA SCOTIA
Environment

1303

Charting our Course

Newfoundland Labrador

CLIMATE CHANGE ACTION PLAN 2011

TABLE OF CONTENTS

LETTER FROM THE PREMIER

LETTER FROM THE MINISTERS

1.0 INTRODUCTION - CHARTING OUR COURSE 1
- Vision 3
- Guiding Principles 3
- Goals 3

2.0 WHAT IS CLIMATE CHANGE? 4
- 2.1 Understanding the Challenge 5
- 2.2 Climate Change in Newfoundland and Labrador 7
- 2.3 Taking Action 8

3.0 GOVERNMENT'S STRATEGIC APPROACH 11
- 3.1 Building on Successes to Date 12
- 3.2 Providing High-Level Government Leadership 13
- 3.3 Consulting on Climate Change and Energy Efficiency 14
- 3.4 Monitoring Developments in Other Jurisdictions 16

4.0 A SUSTAINABLE FUTURE - ENHANCING RESILIENCE TO CLIMATE CHANGE IN NEWFOUNDLAND AND LABRADOR 20
- 4.1. Climate Change in Northern Labrador 26

5.0 A SHARED CHALLENGE - REDUCING GREENHOUSE GAS EMISSIONS IN NEWFOUNDLAND AND LABRADOR 29
- 5.1 Leading by Example - Provincial Government Action 33
- 5.2 Households 38
- 5.3 Large Industry 40
- 5.4 Small and Medium-Sized Enterprises 44
- 5.5 Fisheries and Aquaculture 48
- 5.6 Forestry, Agriculture and Natural Areas 49
- 5.7 Transportation 51
- 5.8 Waste 52

6.0 LEVERAGING INTERGOVERNMENTAL PARTNERSHIPS 55

7.0 MEASURING PROGRESS 57

8.0 STRATEGIC FRAMEWORK - CLIMATE CHANGE ACTION PLAN 59

ANNEX 1: ACRONYMS AND GLOSSARY 70

ANNEX 2: GREENHOUSE GAS EMISSIONS IN CANADA 74

ANNEX 3: GREENHOUSE GAS REDUCTION TARGETS IN CANADA 75

This page is blank in original document.

LETTER FROM THE PREMIER

Climate change is one of the greatest long-term challenges facing the world today. The science is clear and unambiguous: climate change is happening and requires a serious and sustained global response. Our government believes that Newfoundland and Labrador must be part of the solution and play its part in responding to climate change.

With great challenges come great opportunities. There will be increasing demand for cleaner energy as jurisdictions move to reduce their greenhouse gas emissions. Newfoundland and Labrador is well positioned to meet this demand. Our province has vast clean energy resources and our government is committed to utilizing revenues from our non-renewable resources to support a clean energy future. With the 3000 megawatt Lower Churchill development and our substantial wind resource, we can substantially reduce greenhouse gas emissions in our own province and further afield.

Our government is committed to positioning our economy so we are well placed to seize the opportunities associated with the move to a low-carbon global economy. The innovative wind-hydrogen-diesel technology being developed in Ramea has huge potential for remote communities around the world and our world-renowned expertise in ocean technologies can improve understanding about the impacts of climate change here and elsewhere. As well as innovative technologies, energy efficiency has an important role to play. Cost-effective ways of using less energy will help move us towards our greenhouse gas reduction goals, while simultaneously reducing fuel bills and enhancing competitiveness.

Efforts to reduce greenhouse gas emissions must of course go hand-in-hand with moves to adapt to unavoidable impacts of climate change. Newfoundland and Labrador's geography, economy, and culture have been shaped the sea, as such we will be affected by changes to the ocean, such as sea-level rise and coastal erosion. These and other impacts could affect forestry, agriculture, wildlife, the marine environment, infrastructure and our communities. We must ensure that we have the information and capacity needed to make the right decisions to manage these impacts and that we embrace new ways of thinking and planning so that our communities are more resilient and well prepared for the future.

The scale of the challenge is considerable. Success will depend on everyone playing their part to work together towards a common end. Our government is committed to pursuing a pathway that is both environmentally sound and economically prudent and providing leadership as we chart our course forward.

Sincerely,

Kathy Dunderdale
Premier of Newfoundland and Labrador

LETTER FROM THE MINISTERS

Climate change is one of the most important issues facing Newfoundland and Labrador. It is an issue that will affect our environment and communities, but it also presents new opportunities for clean energy development, energy efficiency, the application of innovative technologies, and economic growth.

The Government of Newfoundland and Labrador is committed to taking action and *Charting our Course: Climate Change Action Plan 2011* sets our strategic directions for the next five years. Our commitments and targets are ambitious, but the importance of this issue to our province demands that we set a course for success and dedicate ourselves to pursuing it. This action plan is being released alongside a separate but complementary document on energy efficiency called *Moving Forward: Energy Efficiency Action Plan 2011*. This is in recognition of the fact that, in addition to being a key part of our efforts to reduce greenhouse gas emissions, energy efficiency has wider economic and social benefits.

Both plans were developed with significant input from individuals and entities outside of government. In particular, the consultations on climate change and energy efficiency held in the spring of 2010 provided important insights and the input received was central to the development of this plan. The importance of future collaboration is a key guiding principle of this plan and our government is committed to working with other governments, industry, communities, researchers and other stakeholders as we take the next steps in responding to climate change.

Charting our Course: Climate Change Action Plan 2011 addresses the two key aspects of an effective response to climate change: adapting to the unavoidable impacts of climate change and reducing our greenhouse gas emissions to meet the targets we have committed to. Major weather events such as Hurricane Igor underscore both the need to better understand long-term changes in our climate and the importance of global action to mitigate greenhouse gas emissions to avoid worse impacts in future.

We begun our journey on climate change with previous strategies such as the 2005 Climate Change Action Plan and built on this foundation over time with targeted initiatives such as the Green Fund and, more recently, new investments in Budget 2011. We have made important progress, but more work remains. From how we work with industry to reduce their carbon footprint, to how we monitor changes in our climate and design our communities and infrastructure, there are untapped opportunities in Newfoundland and Labrador. To drive action across economic sectors, our government is committed to leading by example in the policies we establish and in the way we manage our own operations. Climate change is one of the most important issues facing our province and how we respond over the years and decades ahead will shape our economy, communities and broader society.

Sincerely,

Ross Wiseman
Minister of Environment and Conservation

Shawn Skinner
Minister of Natural Resources

Torngat Mountains, NL
Image Source: Chris P. Sampson

1

INTRODUCTION

Charting Our Course

1.0 INTRODUCTION – CHARTING OUR COURSE

The Government of Newfoundland and Labrador believes that climate change is one of the greatest long-term challenges facing the planet, and it is committed to fulfilling the province's potential to be a global leader in this area. Government recognizes that climate change is not just an environmental issue – it is equally an economic and social issue that can impact the province and present opportunities for job growth, innovation, and clean energy development.

This plan - Charting Our Course: Climate Change Action Plan 2011 - sets out the Provincial Government's commitment to action over the next five years. It establishes new directions supported by the latest science on climate change, lessons learned from other jurisdictions, and in-depth research on the challenges and opportunities associated with climate change in Newfoundland and Labrador. The release of this plan fulfills three government commitments: to update the 2005 Climate Change Action Plan, develop a Greenhouse Gas Strategy for the Energy-Intensive Sector, and prepare a Climate Change Adaptation Strategy for northern Labrador.

Point Amour Lighthouse, NL
Image Source: Department of Tourism, Culture and Recreation

This plan takes an economy and province-wide view in recognition of the shared nature of the challenge and the impacts that could affect many areas of the province. These new directions build on government's strong foundation for action on climate change established through its 2005 Climate Change Action Plan, 2007 Energy Plan, targeted programs such as the Green Fund, and extensive collaboration with other governments. These efforts illustrate government's balanced approach to promote economic growth while responding to climate change, with efforts ranging from clean energy development and energy efficiency programs to helping communities adapt to changing climatic conditions.

Few jurisdictions can match Newfoundland and Labrador's ability to support a low-carbon global economy. Newfoundland and Labrador has exceptional assets that can benefit regional, national and global efforts on climate change. These include existing clean energy exports totalling 27.4 terawatt hours in 2009, three wind energy projects including the innovative wind-hydrogen-diesel project in the off-grid community of Ramea, and the 3,000 megawatt Lower Churchill project.

The 2011 Climate Change Action Plan has been released with a companion document, Moving Forward: Energy Efficiency Action Plan 2011. Energy efficiency can make an important contribution to efforts to tackle climate change where it reduces dependency on carbon-intensive fuels. However, energy efficiency has a much wider set of benefits. It can reduce household fuel bills, enhance competitiveness, strengthen energy security, reduce local air contaminants, and free up more power to export to other jurisdictions. As a result, even if all power was generated from clean energy sources there would still be a strong economic rationale for encouraging greater energy efficiency. Given this, the province has decided to publish a separate but complementary action plan on energy efficiency. This fulfills another commitment from the 2007 Energy Plan.

As the following pages illustrate, the 2011 Climate Change Action Plan is comprehensive in nature with a view to: (1) meeting provincial and intergovernmental commitments on climate change; (2) utilizing the advice and contributions received during consultations on climate change and energy efficiency in the spring of 2010; and (3) building on the suite of actions already taken by government departments and agencies. This action plan and its commitments will be guided by an overarching vision, principles, goals and objectives.

Vision

A province that effectively integrates progressive action on climate change into its policy, planning and programs in a way that supports future economic, social and environmental success.

Guiding Principles

The following principles are the cornerstones for government's decision-making on climate change and they will guide the implementation of this plan.

- ***Promote province and economy-wide action***, recognizing the need for all sectors of the economy to play their part in tackling climate change.
- ***Identify and maximize opportunities***, such as the development of the province's clean energy resources, improving competitiveness, promoting energy efficiency and developing new technologies.
- ***Understand and minimize risk***, particularly those associated with the potential impacts of climate change including stronger storm surges, sea-level rise and reduced winter sea ice.
- ***Utilize a blend of policy instruments***, recognizing that effective action on climate change requires the use of multiple approaches ranging from information campaigns to regulation.
- ***Support collaboration and partnerships***, to utilize the experience and expertise that is readily available in the public, private, academic and non-governmental sectors in Newfoundland and Labrador.

Goals

The goals and objectives of this Climate Change Action Plan establish the overarching priorities of the Provincial Government on climate change. The actions contained in this plan are directed at achieving one or more of these goals.

Goal 1: Enhance Newfoundland and Labrador's resilience to the impacts of climate change

Objectives:

- Strengthen the understanding of the impacts of climate change on the province.
- Improve the integration of climate change adaptation into decision-making.

Goal 2: Reduce greenhouse gas emission levels in Newfoundland and Labrador

Objective: Pursue the greenhouse gas (GHG) reduction targets of the Conference of New England Governors and Eastern Canadian Premiers on a provincial basis: 10 per cent below 1990 levels by 2020 and 75-85 per cent below 2001 levels by 2050.

Goal 3: Demonstrate Provincial Government leadership on climate change

Objective: Promote economy-wide action on climate change through policies and measures designed to facilitate widespread engagement and action; and manage government's own operations in a manner consistent with this plan.

Goal 4: Advance action on climate change through collaboration with other governments

Objective: Proactively engage other governments to identify opportunities for collaboration on climate change.

The following pages will discuss the importance of responding to climate change and its relevance to Newfoundland and Labrador, and set out the actions government will take to meet the goals and objectives established in this plan.

Cartwright, NL
Image Source: Shirley Walsh

2

WHAT IS CLIMATE CHANGE?

2.0 WHAT IS CLIMATE CHANGE?

2.1 Understanding the Challenge

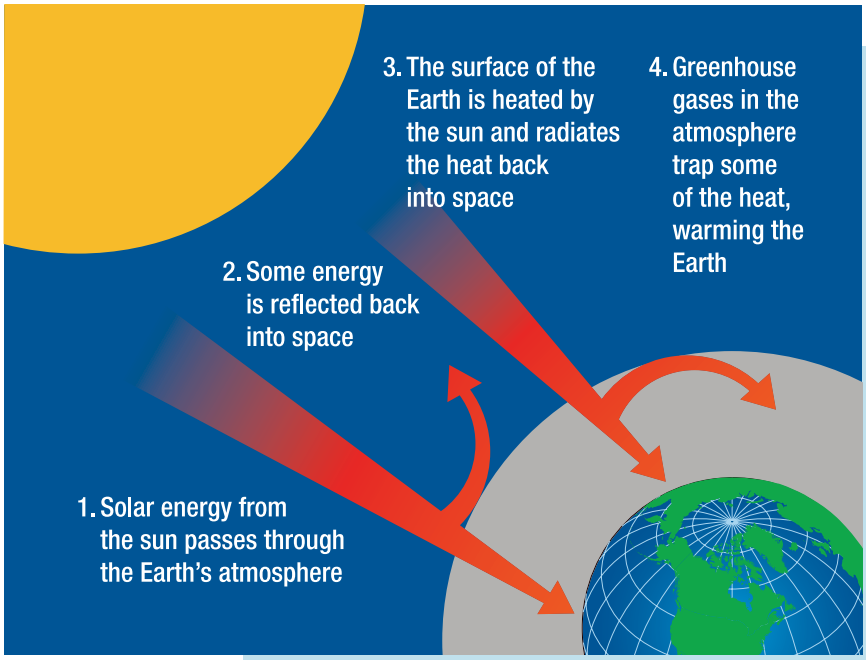
A location's climate, which is defined by variables such as average temperature and precipitation, changes naturally from season-to-season and over time. Climate is closely connected to weather, which reflects the daily or hourly conditions of a location. Climates vary significantly across the globe and also within close geographic areas. In Newfoundland and Labrador, communities face very different climates from northern Labrador to eastern Newfoundland, and inland and coastal locations in between.

The international attention being paid to climate change does not focus on natural trends but rather the impact of human activity. Since the industrial revolution and the widespread use of the combustion engine, economic growth has been powered in large part by the use of fossil fuels such as coal and petroleum products. When these fuels are burned, be it to generate electricity or power vehicles, GHG emissions are released into the atmosphere and stay there for a very long time. These emissions include, among others, carbon dioxide, methane and nitrous oxide. At present, over 30 billion tonnes of GHGs are emitted globally each year by burning fossil fuels[1].

While the combustion of fossil fuels is one of the largest sources of GHG emissions on the planet and accounts for approximately 90 per cent of GHG emissions in Newfoundland and Labrador, the way that land and forests are managed is also important. An estimated 12 billion tonnes of GHG emissions are released globally every year from changes in land use[1]. For example, trees absorb carbon dioxide when they are growing, but release it after they are harvested, soils store carbon dioxide but can release it when disturbed, fertilizers contain nitrous oxide which is released during farming, and vegetation can emit methane in landfills when it decays without oxygen. While nitrous oxide and methane are emitted in much smaller amounts than carbon dioxide, they are 310 and 21 times more powerful than carbon dioxide in their ability to trap heat in the atmosphere, respectively.

As a result of these human activities, the rate with which GHG emissions are being emitted has reached levels unprecedented in the planet's history and the atmospheric concentration of carbon dioxide is now higher than at any time in at least the last 800,000 years. The levels of carbon dioxide, methane and nitrous oxide have risen significantly since the industrial revolution and the concentrations of these gases in the Earth's atmosphere is causing the planet to warm.

[1] Calculated from World Resources Institute figures.



The Greenhouse Effect

Life on Earth is sustained by naturally occurring gases in the atmosphere which allow the sun's rays to pass through to warm the Earth, and then trap some of the warmth to prevent it from escaping out into space. This is known as the natural greenhouse effect and, without it, it would be too cold to support many of the life forms on Earth. Since the industrial revolution, human activities have rapidly increased the amount of GHGs emitted into the atmosphere.

These additional GHGs have thickened the blanket of gases surrounding the Earth, making it more difficult for the heat reflected off the Earth's surface to escape into space. This has caused the Earth's average surface temperature on land and in the sea to rise thereby affecting the complex web of systems that support life on Earth.

The Intergovernmental Panel on Climate Change is the global scientific authority on climate change science. It has concluded that climate change is happening, the planet is warming, and the release of GHG emissions from human activity is by far the most likely cause. It has found that the impacts of climate change are already evident, such as polar ice melt, sea-level rise and shifts in the timing of seasons.

Intergovernmental Panel on Climate Change (IPCC)

The IPCC, established in 1998 by the United Nations and the World Metrological Office, is considered the world's most authoritative voice on climate change science. The IPCC does not carry out research; rather, its findings are based on the assessment of existing peer-reviewed and published scientific and technical literature. Its most recent report (2007) was peer-reviewed by over 2500 experts from 130 countries.

In its 2007 report, the IPCC concluded that it is "unequivocal" that the planet is warming and there is over 90 per cent probability it is due to the release of GHG emissions from human activity. It estimated that temperatures could rise by between 1.1°C and 6.4°C by the end of the century, but the extent of warming will depend on the amount of GHGs emitted globally over the coming decades.

The IPCC found that the impacts of warming are now evident in many of the Earth's natural systems, both physical (such as melting glaciers and rising sea levels) and biological (such as the poleward shift in plant and animal ranges).

The next IPCC Assessment Report, due to be released in 2014, will provide an update of knowledge related to climate change.

2.2 Climate Change in Newfoundland and Labrador

Newfoundland and Labrador's weather is often unpredictable and at times volatile, but it is directly relevant to a number of important issues ranging from economic development and public safety to environmental sustainability. Daily weather forecasts help fish harvesters determine the best time to go to sea or return from it, governments in their delivery of public services such as transportation, and emergency response personnel in their planning and response to extreme weather events such as flooding. Equally, the study of climate trends over time supports the safe design of roads, bridges, and offshore oil and gas platforms, municipal and regional land use planning, and long-term power supply and demand management.

Climate change is an important issue for Newfoundland and Labrador. As a large coastal province with over 90 per cent of the population living near the sea, Newfoundland and Labrador is exposed to many long-term impacts of climate change including sea-level rise, more storm surges, greater coastal erosion and volatile changes in seasonal weather patterns. These have important social and economic implications:

- Storm surges and flooding can affect infrastructure, services, and business activity, as seen with Hurricane Igor.
- Coastal erosion and sea-level rise can impact community development and place homes, businesses and coastal infrastructure at risk, such as wharves and causeways.
- Changes in seasonal weather patterns can affect energy demand and supply, along with the agricultural and forestry growing seasons.
- Changes in the ocean environment can affect fish species, vessels and shipping, ice conditions, as well as the site-selection and long-term sustainability of aquaculture farms.

One of the most dramatic and potential costly impacts of climate change will be more extreme weather. Climate change is expected to result in warmer weather with an increase in total precipitation falling in fewer, but more intense, events. Increases in precipitation, especially the *intensity* of precipitation, could impact local infrastructure which is critical to ensuring that services such as health care and education can be provided without disruption. At the same time, changes in winter snow conditions or periods without rain may impact run-off and overall water quality.

Although no single incident can be attributed to climate change, the recent experience of Hurricane Igor underlines the need to understand and prepare for changing environmental conditions. This destructive event, which is estimated by Environment Canada to be unmatched in the province's recent history, caused an estimated $150 million in damages and, at its peak, cut off 150 communities from transportation infrastructure and affected electricity to an estimated 70,000 people. Hurricane Igor reshaped the natural environment and at the same time destroyed roads, homes and buildings, and directly impacted countless residents around the province.

Hurricane Igor – September 2010

Lady Cove
Image Source: Wayne March

Lawn
Image Source: Craig Paisley/CBC

Port Union, NL
Image Source:
Christina Eddy

2.3 Taking Action

Responding to climate change is a complex challenge that has two equally important components: (1) adapting to the unavoidable impacts of climate change and (2) reducing GHG emissions to limit or avoid the potential impacts of climate change in the future.

Climate Change Adaptation

Climate change *adaptation* is a fundamental aspect of climate change policy. As a result of the GHG emissions that have accumulated in the atmosphere since the industrial revolution, the Earth is committed to a certain amount of warming and some impacts are now unavoidable. Adaptation encompasses those actions by governments, communities, businesses and individuals to understand, plan for, and respond to unavoidable changes in the climate. This could include, for example, new planning practices to avoid areas at risk of sea-level rise, building infrastructure to higher standards and exploiting economic opportunities such as the growing demand for environmental and water monitoring. Adaptation is often considered more of a local issue compared to GHG reduction efforts as the impacts, challenges and opportunities can be unique to a specific location. As a result, a fundamental component of adaptation is first improving uderstanding of the potential risks and opportunities.

For example, the community of Placentia has experienced the impacts of extreme weather events in the past and is working to adapt to the challenges associated with sea-level rise. In 2007, the Department of Environment and Conservation partnered with the town and a number of entities, including Engineers Canada, on a vulnerability assessment of the town's infrastructure, including the breakwater, protection wall and a section of the Dunville highway damaged during Tropical Storm Chantal in 2007. This project applied the Public Infrastructure Engineering Vulnerability Committee (PIEVC) engineering protocol, and assessed vulnerabilities to the year 2050 from changing climate events. As a result, the highway infrastructure was upgraded to handle more intense precipitation events and the area experienced minimal damage during Hurricane Igor in 2010.

A similar series of events occurred in the City of St. John's, which invested in significant infrastructure upgrades after the flooding associated with Tropical Storm Gabrielle in 2001. As a result of those upgrades, Hurricane Igor caused minimal flooding in St. John's - despite a similar amount of rainfall falling in 2010 as fell in 2001.

Adapting to climate change and better understanding environmental conditions can also present economic opportunities. In June 2009, the Government of Newfoundland and Labrador released its ocean technology strategy – Oceans of Opportunity: Newfoundland and Labrador's Ocean Technology Strategy. The five-year, $28 million strategy is intended to capitalize on opportunities and expand the province's world-class ocean technology sector. One of the major projects the Provincial Government has supported is 'SmartBay', an initiative led by the Fisheries and Marine Institute of Memorial University. SmartBay, located in Placentia Bay, is the largest ocean observation project in

SmartBay Project, Placentia Bay, NL
Image Source: Fisheries and Marine Institute of Memorial University of Newfoundland

eastern Canada, providing weather forecasting, environmental monitoring and ship navigation support. This project, and others, can play a role in monitoring and responding to changes in ocean conditions and this technology could be exported to other jurisdictions.

GHG Reduction

Given the scientific findings that the growing concentration of GHG emissions in the Earth's atmosphere are causing climate change, reducing GHG emissions has become a key priority of the global community.

There are strong economic imperatives to devise a clear path forward. The IPCC has found that the cost of reducing emissions is significantly less than the cost of responding to the adverse impacts associated with climate change. Moreover, independent think tanks, like Canada's National Roundtable on the Environment and Economy, maintain that delay in taking action to reduce emissions increases the overall cost of meeting GHG reduction targets by locking in less efficient capital stock and creating uncertainty for businesses which may delay their investment in new, energy-efficient equipment.

The challenge of reducing GHG emissions is considerable given the central role of fossil fuels, such as coal, natural gas and oil, to the global economy. However, as the global economy works to transition to a low-carbon future, jurisdictions like Newfoundland and Labrador are well positioned to capitalize on the new economic opportunities.

Few jurisdictions in North America can match Newfoundland and Labrador's clean energy warehouse. Currently, approximately 85 per cent of the electricity in Newfoundland and Labrador comes from clean energy. The 5428 megawatt (MW) Churchill Falls Generating Station and other smaller hydro and wind projects provide significant clean energy to Newfoundland and Labrador and other locations in North America, displacing the need for GHG-intensive electricity generation.

Through the Energy Plan, the Provincial Government committed to utilize revenues from non-renewable energy resources to further support clean energy development. Newfoundland and Labrador is the second largest producer of conventional light crude oil in Canada, accounting for approximately 35 per cent of total Canadian production in 2010. Revenues from oil production can be invested in opportunities such as the 3,000 MW Lower Churchill hydroelectric project (Phase One – 824 MW Muskrat Falls development; Phase Two – 2250 Gull Island development) and harnassing vast wind energy resources that are unrivalled in North America.

The Provincial Government and Nalcor Energy recently made significant progress towards the development of the Lower Churchill project. On November 18, 2010, the Provincial Government and Nalcor Energy signed a term sheet with Emera Inc. to develop the 824 MW Muskrat Falls project, Phase One of the Lower Churchill project, and associated transmission line from Labrador to Newfoundland and on to Nova Scotia. The negotiation of final agreements is underway in accordance with the terms agreed to in the term sheet. This is an important regional project that offers significant national benefits. It will help Newfoundland and Labrador, Nova Scotia, and other locations in North America grow their economies while reducing GHG emissions. It will enable Newfoundland and Labrador Hydro to displace an estimated 1.2 million tonnes (Mt)

of GHG emissions annually from its oil-fired thermal generating station in Holyrood – this is over 10 per cent of the province's current GHG emissions. Further, the project will support an estimated 1 Mt reduction in Nova Scotia and additional reductions of up to 2 Mt in other locations in North America. However, the benefits go far beyond those related to GHG emissions. The development will also increase regional energy stability, enable further renewable developments and, at a cost of $6.2 billion, generate huge economic benefits. In addition to Muskrat Falls, the province continues to advance work towards the development of Phase Two of the Lower Churchill project, Gull Island, a second hydroelectric site with the potential capacity of 2250 MW (annual average energy production of 12 TWh - Terrawatt hours), to supply electricity markets in the region.

Developments such as the Lower Churchill offer unparalleled opportunities to make a significant reduction in GHG emissions. However, in addition to switching to low or zero GHG-emitting sources of energy, there are other important approaches that can also help to lower GHG emissions while simultaneously supporting economic growth and competitiveness, such as energy efficiency, as set out in Moving Forward: Energy Efficiency Action Plan 2011.

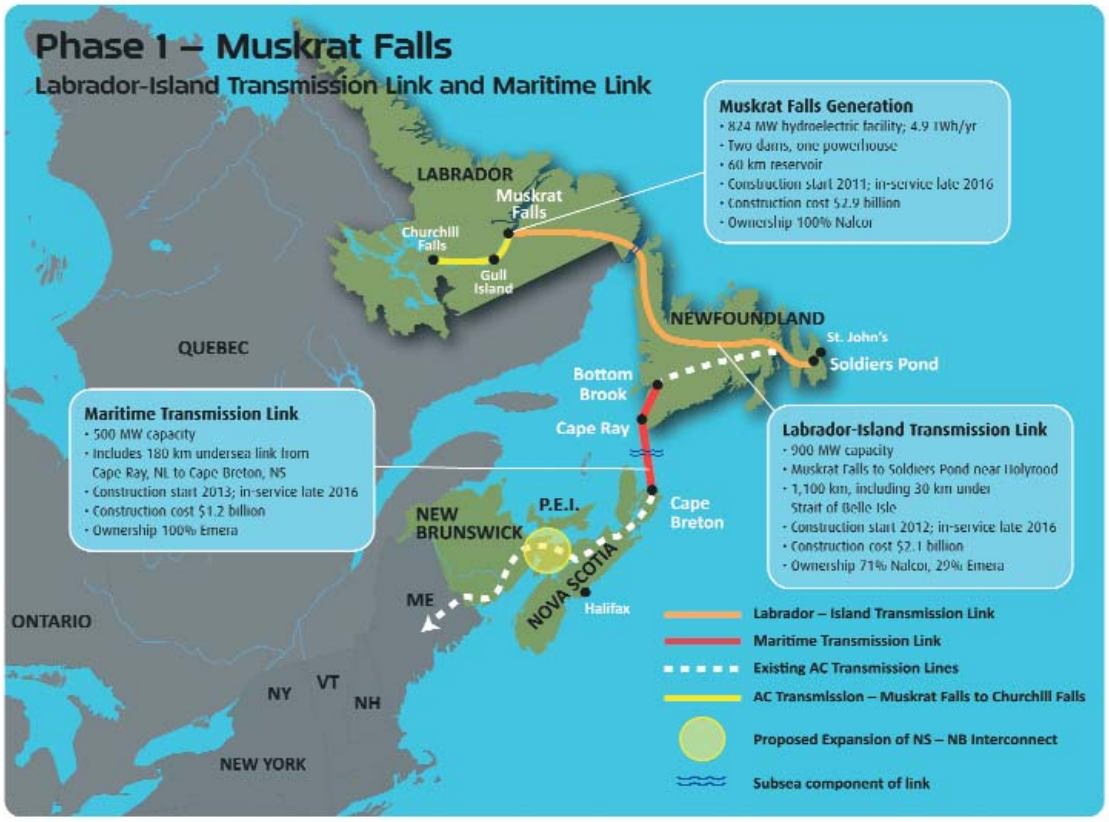
Muskrat Falls Hydroelectric Project

Top: Signing of the Muskrat Falls Term Sheet. (From left: President and CEO of Nalcor, Ed Martin; then Newfoundland and Labrador Premier Danny Williams; then Minister of Natural Resources and current Premier of Newfoundland and Labrador, Kathy Dunderdale; and Nova Scotia Premier Darrell Dexter)

Right: Electricity transmission map for Muskrat Falls
Image Source: Nalcor Energy

Summary Facts – Muskrat Falls

- Newfoundland and Labrador will have an electricity system that will be over 98 per cent GHG-free.
- The development will avoid approximately 96 Mt of emissions by 2065 within the province alone.
- Total income to labour and business for the province will be $1.4 billion and over $210 million in taxes will accrue to the Provincial Government.
- It will result in 8,600 person years of employment in the province (5,400 in Labrador) and indirectly induce employment of 18,400 person years (7,500 in Labrador).
- The Prime Minister of Canada has committed to provide a loan guarantee or equivalent to finance the project.



Inukshuk in Torngat Mountains, NL
Image Source: ©Barrett & MacKay
Photo: courtesy of the Department of Tourism, Culture and Recreation

3

GOVERNMENT'S STRATEGIC APPROACH

3.0 GOVERNMENT'S STRATEGIC APPROACH

The case for action is clear – jurisdictions that take proactive action on climate change and energy efficiency will be best positioned to harness economic opportunities and manage risk. Jurisdictions that do not act on this agenda may incur higher costs in the long run, miss economic opportunities and could be vulnerable to the adverse impacts of climate change and the associated costs.

The Government of Newfoundland and Labrador is committed to playing a constructive role in responding to climate change and moving forward in a manner that ensures the province will be a model of economic and environmental sustainability. This section outlines the factors that have informed the development of this plan and will guide its implementation.

3.1 Building on Successes to Date

The Provincial Government has established a strong foundation for further action on climate change. In 2005, government released the province's first-ever Climate Change Action Plan which outlined 40 action items focused on reducing GHG emissions, adapting to the impacts of climate change, strengthening the research base on climate change and developing the local and regional partnerships to support collaborative action.

The 2005 plan raised the profile of climate change in Newfoundland and Labrador, making clear the need to pursue a twin-track approach that balances efforts to reduce GHG emissions with moves to advance adaptation to the impacts of climate change. The plan, released by the then Minister of Environment and Conservation, focused on a series of priority actions across government. Some key initiatives pursued through the plan included: climate change risk and vulnerability assessments with communities in the province; public awareness and education efforts through funding for the Climate Change Education Centre; workshops and conferences including hosting the first conference in Canada on climate change and health impacts in 2006 and supporting the Climate Change and Renewable Resources in Labrador conference in 2008; multiple research projects with the academic community; and targeted energy efficiency projects across economic sectors.

In 2007, the Provincial Government released its comprehensive Energy Plan, Focusing Our Energy. The plan laid out the long-term vision to develop the province's energy warehouse and utilize revenue from its non-renewable resources to fund a clean, renewable energy-powered future. While clean energy development, particularly the development of the 3,000 MW Lower Churchill hydroelectric project, was the centerpiece of the Energy Plan, it also laid out government's commitment to advance energy efficiency across the economy. This plan committed to update the 2005 Climate Change Action Plan and prepare a Greenhouse Gas Strategy for the Energy-Intensive Sector, each of which is fulfilled in this document.

The 2005 Climate Change Action Plan and 2007 Energy Plan are the two signature plans that lay out government's commitment to take action on climate change and energy efficiency. These initiatives have been complemented by action taken through other strategies, such as a study of the impacts of climate change on inland fish species in Labrador advanced through the Northern Strategic Plan. The plan also committed to developing a Climate Change Adaptation Strategy for northern Labrador - a commitment that is fulfilled in this document.

These efforts have been complemented by targeted programs like the Newfoundland and Labrador Green Fund, the Atlantic Climate Adaptation Solutions program and other related initiatives.

This plan demonstrates that environmental issues, such as climate change and resource management, are key considerations in government's decision-making and the long-term sustainability of the province. On one level, research is needed to improve the understanding of the environmental impacts of climate change and to enhance capabilities to manage and adapt to it. On another level, investments in research and development (R&D) through to deployment are needed in order to realize the potential benefits of low-carbon technologies. A portfolio of new and existing technologies will be required to achieve the scale of GHG reductions required. Existing technologies can also be deployed to improve the energy efficiency of industrial processes and equipment, commercial and residential buildings, various modes of transportation, and local and regional climate monitoring. Recognizing the significant cost of R&D through to deployment, government policies, programs and regulatory instruments need to focus on the technologies that have the greatest potential for achieving Newfoundland and Labrador's climate change priorities.

3.2 Providing High-Level Government Leadership

In 2009, the Government of Newfoundland and Labrador established the Office of Climate Change, Energy Efficiency and Emissions Trading. This Office, located in Executive Council and reporting to the Premier, serves as the lead within the Provincial Government for strategy and policy development on climate change and energy efficiency.

The Office of Climate Change, Energy Efficiency and Emissions Trading was established to raise the profile of the issues, boost government's capacity to act in this growing and important area, and to act as a broker across departments, given the cross-cutting nature of the climate change challenge. It implements the priorities of the government and supports actions by departments to better integrate action on climate change and energy efficiency into their operations. The Office led the development of this Climate Change Action Plan and the accompanying Energy Efficiency Action Plan, in consultation with other key departments such as Natural Resources and Environment and Conservation.

Muskrat Falls, NL
Image Source: Nalcor Energy

3.3 Consulting on Climate Change and Energy Efficiency

In May 2010, the Provincial Government released the discussion document, Responding to Climate Change in Newfoundland and Labrador, and invited the public to submit their views. Submissions received to this document were complemented by input from 13 targeted consultation sessions held across Newfoundland and Labrador in June 2010 in Labrador City, Happy Valley - Goose Bay, St. Anthony, Corner Brook, Stephenville, Grand Falls - Windsor, Gander, Marystown, Clarenville and St. John's. These were held with a broad range of representatives from industry, academia, municipalities, labour organizations, and the voluntary and not-for-profit sector.

The input received from this consultation process was highly informative and can be broadly organized into seven key themes:

(a) Government Must Lead By Example: Participants felt that the Provincial Government must capitalize on its ability to influence the behaviour and culture of the people of the province, while supporting change in the marketplace. Examples of possible leadership opportunities included greater energy efficiency in government buildings, lowering the carbon footprint of overall operations, and supporting change through procurement policies and regulation.

> ***Government's Response:*** Demonstrating leadership is a key goal of this plan. This has two aspects: establishing the necessary policies and measures to lead wider society, and managing government's own operations to reduce its carbon footprint. This plan contains a number of commitments to generate enhanced awareness and incorporate climate change considerations into, for example, building management and procurement policies.

(b) Addressing Climate Change is a Shared Responsibility: There was broad agreement that responding to climate change is a shared responsibility that requires action by all parts of society, from individuals and households, to industry, business, academia, the voluntary and not-for-profit sector, and government. Participants felt that government was best placed to facilitate action in all quarters.

> ***Government's Response:*** Since all sectors are responsible for emitting GHG emissions, all sectors must contribute to reducing emissions. Equally, both private and public sectors need to integrate adaptation considerations into their decision-making. With this in mind, this Plan lays out a comprehensive approach towards responding to climate change. It also makes clear the need to continue to work with partners in other governments, business, and the academic and not-for-profit sectors as government moves forward.

(c) Public Awareness Efforts Must be Strengthened: Participants agreed that addressing climate change is a priority but felt that most members of the public have low awareness of the issue, how it could impact the province, and ways that they could make a difference. Some participants noted that they were not always aware of existing programs while others found it difficult to find an authoritative source of advice. There was recognition that a focus on children and youth can provide strong returns over time.

> ***Government's Response:*** In Budget 2011, government committed to develop a new public awareness campaign on climate change and energy efficiency. This new initiative will build on, and seek synergies with, existing campaigns such as the Multi-Materials Stewardship Board's (MMSB) Get to Half campaign, which

aims to reduce waste in the province and the Newfoundland and Labrador Hydro and Newfoundland Power's takeCHARGE initiative that promotes energy efficiency in the residential and commercial sectors.

(d) Government Should Utilize a Variety of Policy Instruments to Affect Change**:** There was a consistent message from participants that government must utilize a variety of policy instruments to influence the behaviours of individuals and businesses in the province. They felt that behavioural change is unlikely without a multi-faceted approach that utilizes information campaigns, education, research and development, regulation and financial support.

Government's Response: This plan utilizes a variety of policy instruments to move the province forward on climate change. This includes better information and awareness, the exploration of codes and regulations affecting the energy efficiency of buildings and energy-using products, and enhanced research and decision-making tools to support climate change adaptation.

(e) Additional Research is Required on Long-term Impacts: Most participants felt they had observed changes in the provincial climate during the past 10-15 years. There was recognition that more research and monitoring is required to better understand the impacts across communities and regions within the province over time.

Government's Response: The Provincial Government acknowledges the importance of accurate, high-quality information to support decision-making. This plan makes clear the commitment to further strengthen the evidence base going forward, and to continue to work collaboratively with partners in the academic and research sectors. These partners have already made a significant contribution to understanding the impacts of climate change on the province.

(f) Opportunities to Reduce GHG Emissions: The majority of participants indicated that taking steps to improve energy efficiency and fuel-switching presented the best opportunities to reduce GHG emissions in the province. A number of participants indicated that energy efficiency presented opportunities that could be pursued in the short to medium term, while fuel-switching, particularly the development of Lower Churchill, presented strong opportunities in the medium to long term.

Government's Response: Government recognizes the importance of energy efficiency and fuel-switching. This Climate Change Action Plan lays out a multi-faceted approach to reducing GHG emissions that reaches out to all sectors and utilizes various policy instruments to achieve targets. Energy efficiency plays a key role in this effort and the accompanying Energy Efficiency Action Plan outlines Government's approach to promote energy efficiency for the benefit of the province.

(g) Support for Strategic Objectives: There was broad support from participants for the strategic objectives stated in the discussion document, namely:

- To establish credible emissions reduction targets and mechanisms to achieve those targets.
- To consider how to place a value on GHG emissions so businesses and individuals have a financial incentive to consider the climate change impact of their activities.

- To identify and maximize economic opportunities arising from climate change, including clean energy development, innovation and technology advancement.
- To encourage and facilitate businesses, consumers and other users to enhance and maximize energy conservation and efficiency.
- To establish mechanisms to comprehensively address adaptation issues arising from climate change.
- To build public awareness and raise the level of public knowledge about climate change and the role that individuals and organizations can play in tackling it.

Government's Response: Each of these objectives has informed the development of this Plan, resulting in the comprehensive approach adopted by government. In addition, government acknowledges the importance of two other strategic priorities raised by participants during the consultations, namely, the need to promote synergies with social objectives where possible and to support research and development. Several key initiatives in this plan, such as the renewal of the energy efficiency program for low income households and the integration of climate change into the province's research efforts, address these imperatives.

3.4 Monitoring Developments in Other Jurisdictions

Responding to climate change is a global challenge as all jurisdictions are affected by the impacts of climate change and must take action to contribute to global GHG reductions. The Provincial Government closely tracks policy development in other jurisdictions to understand the potential implications for Newfoundland and Labrador and identify potential areas for collaboration. Actions by other levels of government, particularly the Federal Government, can inform the directions of the Provincial Government. The actions could include new regulations for certain sectors or targeted programs to reduce GHG emissions.

International

International efforts to address climate change are spearheaded by the United Nations Framework Convention on Climate Change (UNFCCC). The Kyoto Protocol was negotiated in 1997 under the UNFCCC, and it is the first legally binding agreement to set GHG reduction targets for developed countries (like Canada, Japan and those in the European Union), but not developing countries (like China, Brazil or India).

Nations are currently working to develop a new international agreement as the current commitments under the Kyoto Protocol expire in 2012. Significant global efforts have been invested in recent rounds of negotiations in Copenhagen, Denmark in December 2009, and Cancun, Mexico in December 2010, but a new agreement remains outstanding. Efforts are currently being directed at securing an agreement at the next round of negotiations scheduled to take place in Durban, South Africa in December 2011.

These negotiations are important to Newfoundland and Labrador, as they dictate the speed and approach of countries around the world to tackling climate change. They also provide a forum at which countries, sub-national jurisdictions, businesses, non-governmental organizations, and the research community share information on climate change. While Canada participates in these negotiations, any policy commitments that the Federal Government enters into on behalf of Canada, that affect provincial and territorial jurisdiction, must be implemented in partnership with provinces and territories.

North America

In Canada, the Federal Government has committed to reduce GHG emissions by 17 per cent below 2005 levels by 2020. It has yet to release its comprehensive approach to achieve this goal but it continues to advance a series of targeted initiatives on vehicles, biofuels and coal-fired power generation.

The Federal Government continues to develop its approach for the large industrial sector. In 2007, it released its Turning the Corner plan, which would have established a national emissions trading scheme to reduce GHG emissions from large industrial sectors like oil and gas, refining, mining and manufacturing. However, it decided to indefinitely delay this plan upon the election of U.S. President Barrack Obama in November 2008, in order to harmonize its approach with that of the U.S.

Federal Government Initiatives on Climate Change

- Beginning in 2015, new regulations for the coal-fired electricity sector are expected to phase out traditional coal-fired electrical power plants as they reach the end of their commercial life and apply stringent performance standards to new plants. This is intended to meet the federal goal of having 90 per cent of electricity in Canada generated from cleaner energy resources, such as renewable energy or natural gas, by 2020.
- The Federal Government recently harmonized new efficiency standards for light-duty vehicles with the U.S.. It is estimated that by 2016, average new vehicle GHG emissions will be 25 per cent lower than in 2008, with anticipated total GHG reductions of 92 Mt. The Canadian and U.S. governments have also announced their intention to harmonize regulations for heavy-duty vehicles.
- In September 2010, the Federal Government finalized regulations requiring a 5 per cent renewable content in gasoline. It is currently finalizing regulations that would require a 2 per cent renewable content in diesel and home heating oil. Taken together, these regulations are anticipated to reduce GHG emissions in Canada by 4 Mt.

Carbon Pricing

There is widespread recognition of the need to take into account the societal costs of GHG emissions in order to affect reductions. By placing a monetary value on GHG emissions (often referred to as carbon pricing), governments, business and individuals have an incentive to reduce emissions through, for example, energy efficiency improvements or switching to cleaner fuel sources. There are two ways to create a carbon price: carbon taxes or emissions trading.

Carbon Taxes

A carbon tax is intended increase the price of more carbon-intensive fuels relative to less carbon-intensive or zero GHG emitting fuels such as renewable energy. In Canada, British Columbia and Quebec have both adopted carbon taxes. In 2008, the Government of British Columbia introduced a tax on fuels such as gasoline, diesel and propane. The tax is paid at the retail level and has increased over time. While the tax has led to fuel price increases, provincial legislation requires that the revenue from the tax be returned to individuals and businesses through lower income tax and other measures. In contrast, the Government of Quebec levies its carbon tax on fuel distributors rather than consumers and directs the revenue raised to Quebec's Green Fund to support the implementation of the province's climate change strategy.

Emissions Trading

The concept behind emissions trading is straightforward; given that climate change is a global problem and the environmental effect of reducing emissions is the same wherever the reductions take place, it makes economic sense to reduce emissions where the cost is lowest. An emissions trading system allows regulated companies greater flexibility in how they comply with their GHG target, thereby reducing the overall cost of compliance.

Under an emission trading system, a government sets a limit on the amount of GHG emissions that can be released by certain industries each year. Regulated companies are then required to obtain tradable credits to cover their emission levels. Companies that reduce their GHG emissions below the target set by government will require fewer credits and can sell any surplus credits to generate revenue. Companies that are unable to reduce their emissions can purchase credits to comply with their target. Emissions trading systems may also provide for the use of offset credits. These are credits which are generated by GHG-reducing projects in sectors that fall outside of the emissions trading system, for example, a forestation project that reduces GHGs through sequestering carbon dioxide. There are currently emissions trading systems in operation in the northeastern and mid-Atlantic states, the European Union, New Zealand, and under the Kyoto Protocol.

Clarity on the U.S. approach to climate change is beginning to emerge after several pieces of legislation did not pass through Congress in 2009 and 2010. The U.S. Environmental Protection Agency (EPA) has recently advanced two signature initiatives to lower GHG emissions from large industry: (1) in January 2011, the EPA's "Tailoring Rule" became effective which will require that large new or modified facilities obtain

permits to emit GHG emissions and utilize best available technologies to minimize GHG emissions; and (2) in December 2010, the EPA announced it would set new performance standards for the electric power plant and oil refinery sectors, which together account for 40 per cent of U.S. GHG emissions.

The direction of the Federal Government is important to Newfoundland and Labrador. It has the jurisdiction and scope to act in a number of policy areas that the province does not (e.g. vehicle efficiency standards), and its policies for sectors such as large industry can have important implications for the province. The Government of Newfoundland and Labrador actively engages the Federal Government through multiple channels to better understand their future directions, and to ensure that the interests of Newfoundland and Labrador are represented.

Provinces, Territories and U.S. States

While the Canadian and U.S. Federal Governments continue to develop their approach to climate change, many provinces and states in North America continue to press forward with innovative policies and programs. For example:

- In 2008, 10 northeastern and mid-Atlantic U.S. states launched the Regional Greenhouse Gas Initiative, which Is an emissions trading system covering the electricity sector. Over $886 million has been raised since the first auction of trading allowances, of which about 70 per cent has been re-invested in energy efficiency and renewable energy. In May 2011, New Jersey announced that it intends to withdraw from the initiative.
- Seven U.S. states and four provinces (British Columbia, Ontario, Manitoba and Quebec) are members of the Western Climate Initiative (WCI). WCI intends to introduce a cap-and-trade system in 2012, as well as other regulations, to reduce regional emissions by 15 per cent below 2005 levels by 2020. It is expected that British Columbia, Quebec and California will enter the cap-and-trade system in 2012.
- Alberta is implementing a regulatory framework which seeks to reduce its GHG *intensity* (the GHG emissions to Gross Domestic Product ratio) by 50 per cent between 1990 and 2020. All industrial facilities with emissions of at least 100,000 tonnes participate in the system. Saskatchewan is pursuing a generally similar approach. Nova Scotia is implementing regulations to reduce emissions in its electricity sector.
- British Columbia and Quebec have introduced carbon taxes on the sale of fossil fuels and use the revenue to either fund tax cuts for consumers (British Columbia) or fund further action under their climate change plan (Quebec). Manitoba recently announced that it will introduce a carbon tax on coal-fired electricity emissions.

The Provincial Government closely studies the approaches taken in other sub-national jurisdictions to move forward on climate change to understand the relative merits of their different policies and their relevance to Newfoundland and Labrador. Lessons learned have informed discussions with the large industrial companies on the government's approach to that sector, as well as other priority areas including energy codes and reducing emissions in the transportation sector. Continued collaboration with these partners is a key priority of the Provincial Government as it moves forward with the implementation of this action plan.

Tors Cove, NL
Image Source: ©Barrett & MacKay Photo, courtesy of the Department of Tourism, Culture and Recreation

4

A SUSTAINABLE FUTURE

Enhancing Resilience to Climate Change in Newfoundland and Labrador

4.0 A SUSTAINABLE FUTURE - ENHANCING RESILIENCE TO CLIMATE CHANGE IN NEWFOUNDLAND AND LABRADOR

As the initial sections of this plan make clear, it is unquestionable that the impacts of climate change present new challenges for the people and communities of the province. The Provincial Government is working to adapt to these challenges and embrace the opportunities that exist, such as improving planning and construction practices, expanding research efforts and improving decision-making tools.

Promoting action on adaptation is a long-term challenge and one that is fundamental to the sustainability of Newfoundland and Labrador. Scientists advise that, because GHG emissions can stay in the atmosphere for significant periods of time, the climate will continue to change even if global GHG emissions were reduced to zero today. This means that the planet is already committed to a certain amount of warming and some impacts are already being seen. However, the extent and severity of impacts over the coming decades will be determined by the level of GHG emissions countries continue to emit going forward. Therefore, efforts to reduce GHG emissions must proceed hand-in-hand with efforts to adapt to a changing climate.

The Provincial Government has moved steadily forward with a series of progressive initiatives on climate change adaptation. In the 2005 Climate Change Action Plan half of the 40 action items were dedicated to understanding the impacts of climate change and supporting adaptation in local communities and economic sectors such as fisheries and aquaculture.

The work of the Provincial Government is complemented by significant expertise in the research and academic community. This includes Memorial University (and related entities such as the Grenfell Campus, the Labrador Institute and the Fisheries and Marine Institute), the Centre for Fisheries Ecosystems Research and the Institute for Biodiversity, Ecosystem Science and Sustainability. The work of these entities has greatly expanded the understanding of climate change in the province and, in the case of many projects, has helped communities better understand and prepare for climate change.

Actions to Date – Climate Change Adaptation:
Through this plan, the Provincial Government is committed to ensuring that Newfoundland and Labrador is a province that understands, prepares for, and is more resilient to climate change. Some of the targeted initiatives that the Provincial Government has supported to date and will build on going forward include:

Understanding Climate Change Impacts

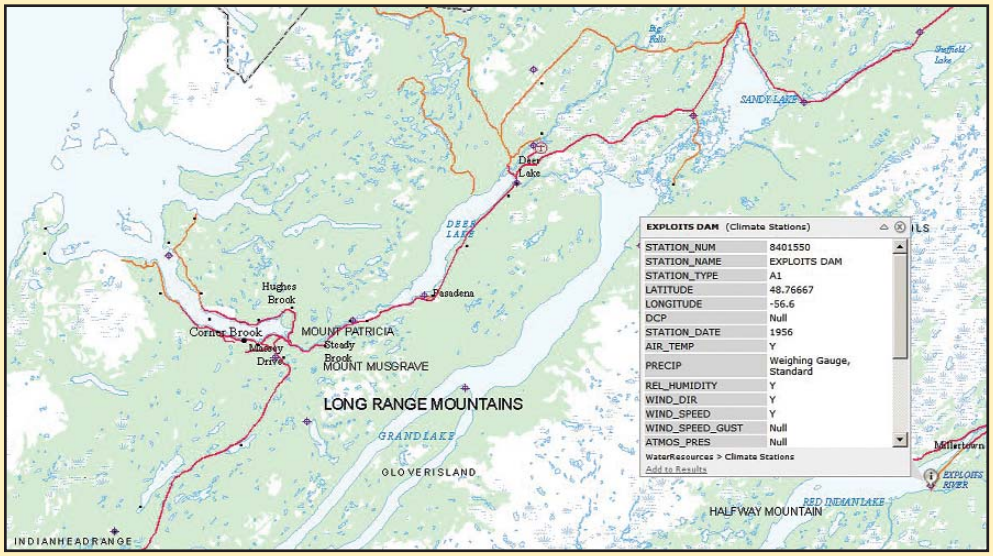
- The Department of Environment and Conservation has funded a number of research projects including studies on the risks and hazards of climate change on communities, the potential impacts of climate change on provincial parks and natural areas, and the impact on natural resources including the fishery. The department has also moved steadily forward on advancing the sustainable development agenda in Newfoundland and Labrador. In 2006, it released a public position paper on sustainable development and it continues to support climate change-related projects through the Institute for Biodiversity, Ecosystem Science and Sustainability.
- The Department of Fisheries and Aquaculture has provided extensive support to fisheries monitoring and research related to climate change as it can affect, for example, invasive species and the safety of aquaculture operations from storm activity. A new Aquaculture

St. John's, NL

Fish Health Facility in St. Albans, as well as existing partnerships with Memorial University and the Fisheries and Marine Institute, will further support this work.

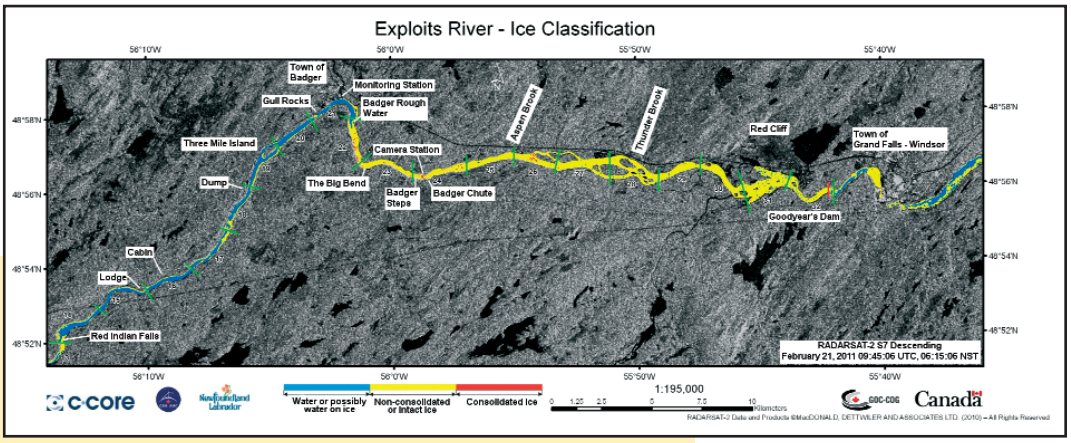
- The Office of Climate Change, Energy Efficiency and Emissions Trading commissioned Dr. Norm Catto from Memorial University to conduct a review of the existing literature on impacts and adaptation within, and relevant to, Newfoundland and Labrador.
  A copy of the study can be found at:
  http://www.exec.gov.nl.ca
  /exec/cceeet/publications/index.html
- In February 2011, the Office commissioned a study of climate change monitoring capabilities in the province. This study seeks to: (1) develop a comprehensive inventory of the number, location and characteristics of climate monitoring stations in the province; (2) understand the needs of key industries, entities and stakeholders as they relate to climate data and information; and (3) identify measures to address any identified weaknesses or deficiencies in the province.
- The Department of Environment and Conservation has established a number of climate stations to monitor and track daily weather and trends over time. Data from these sites are available through the Water Resources Portal, an online Geographic Information System that allows the public access to information on these climate sites. It is located at:
  http://maps.gov.nl.ca/water/

Water Resources Portal – The Department of Environment and Conservation's online Water Resources Portal provides information on the climate in Newfoundland and Labrador and links to many climate stations in the province. This Geographic Information System is publicly available and is a valuable decision-making tool for community managers, emergency management personnel and the private sector. The image below depicts western Newfoundland and various climate stations maintained by the Provincial and Federal Governments that provide specific information about that area.



Map from the Newfoundland and Labrador Water Resources Portal
Image Source: Department of Environment and Conservation

- The Department of Environment and Conservation has implemented targeted projects for areas that are at a particular risk of flooding, such as the Town of Badger.



Map from the Badger River Ice Service
Image Source: Department of Environment and Conservation

Badger River Ice Service

An innovative project in the Town of Badger comprise of real-time cameras on the Exploits River and flood forecast models, satellite imagery and risk alert systems for provincial, community and emergency response personnel. This project was developed in partnership with the European Space Agency and has been presented internationally as a model for other jurisdictions to learn from, including at the 2008 United Nations Climate Change Conference in Poland. The Badger River Ice Service is currently provided with the support of the Canadian Space Agency and Public Safety Canada. The image above is a satellite image of the Exploits River that provides information on ice conditions. Decision makers are able to assess where ice is building up and becoming consolidated, which increases the potential for an ice jam and flooding in Badger.

Integrating Adaptation into Decision-Making

The Provincial Government, in particular the Department of Environment and Conservation, has worked with several non-government organizations, including the Climate Change Education Centre, Building Owners and Managers Association (BOMA), Newfoundland Environmental Industry Association (NEIA), and the City of St. John's to raise awareness on climate change and promote the integration of this issue into decision-making. Initiatives have included:

- In 2006, a conference on climate change and health was held to raise the profile of the impacts of climate change on public health. This two-day conference looked at a broad scope of impacts due to warming temperatures, including the effects of natural disasters and the related stress on public health and service delivery.
- In 2008, a Municipal Climate Adaptation Workshop for the Atlantic provinces was held to bring information on climate change adaptation to the municipal level. It was a collaborative effort by the Conference of New England Governors and Eastern Canadian Premiers, International Council for Local Environmental Initiatives, and the Federation of Canadian Municipalities.
- Since April 2010, the province has partnered with the other Atlantic provincial departments of the environment and Natural Resources Canada on the Atlantic Climate Adaptation Solutions initiative, which is advancing a number of collaborative efforts on climate change adaptation.
- At the July 2010 Council of the Federation (COF) meeting, Premiers launched the Climate Change Adaptation Community of Practice to facilitate the sharing of knowledge among academics and experts across the country, with the goal of helping governments incorporate climate change adaptation into planning and policies.
- In March 2011, two workshops on increased storms and weather hazards were held in Corner Brook and St. John's to help advance community understanding and capacity to adapt to climate

Atlantic Climate Adaptation Solutions Initiative

In April 2010, the four Atlantic provinces and the Federal Government launched the Atlantic Climate Adaptation Solutions (ACAS) initiative. This $8.5 million initiative is helping communities integrate climate change considerations into community planning, engineering practices, and water and resource management decisions. In Newfoundland and Labrador, this initiative is led by the Department of Environment and Conservation, and local projects include:

- Local climate forecasting to the year 2100, specifically targeted at helping communities make better informed planning decisions.
- The Community Vulnerability Assessment Tool to help communities identify where they are vulnerable to the impacts of climate change.
- Development of a Climate Change Adaptation Toolkit to provide communities with the Community Vulnerability Assessment Tool and supporting resources to assist with the integration of adaptation into decision-making.
- An assessment of areas at risk of flooding and a revision of the Flood Risk Mapping Protocol to incorporate climate forecasting and high-resolution mapping tools.

Sea Stacks, Trinity Bay, NL

- An assessment of coastal risks and vulnerabilities (e.g. sea-level rise, coastal erosion, and storm surges).
- Enhancing capacity of practitioners to adapt to climate change by supporting symposiums, conventions and related events held by community planners, engineers and municipal groups. For example, on March 23-24, 2011, the Department of Environment and Conservation hosted the Advancing Decision-Making in a Changing Climate conference, which focused on bringing together municipalities, planners, engineers, provincial and federal governments, researchers, and the insurance industry to share information on adaptation.

change. These were held in partnership with the Humber Arm Atlantic Coastal Action Program and the Building Owners and Managers Association.

- In June 2011, the Departments of Fisheries and Aquaculture and Environment and Conservation released government's Coastal and Ocean Management Strategy and Policy Framework. Climate change has been identified as a priority issue for this work. The document can be found at: http://www.gov.nl.ca/fishaq/publications/coastalstrategy_2011.pdf

Actions Going Forward – Climate Change Adaptation:

The Provincial Government will continue to move forward on a province-wide agenda on climate change adaptation. This includes targeted efforts to address the unique challenges of climate change in northern Labrador, fulfilling a commitment in the Northern Strategic Plan to establish a climate change adaptation strategy for this area.

Over the next five years, the Provincial Government will pursue a series of new actions items, including:

Understanding Climate Change in Newfoundland and Labrador

- Collaborate with other governments and the research and academic community with a view to strengthening long-term climate forecasting for the province.
- Consider the findings of the study on climate change monitoring capabilities in the province and next steps.
- Collaborate with the Federal Government to strengthen climate monitoring networks and information on local precipitation trends to support infrastructure design.
- Continue to strengthen the Newfoundland and Labrador Water Resources Portal and work to identify additional sources of information that can be digitized and made publicly available through this Geographic Information System.
- Continue to implement the Forest Research Strategy which has a strategic focus on better understanding the impacts of climate change on forests in the province.
- Work with the academic and research community to develop research priorities and enhance the dialogue on the impacts of climate change in Newfoundland and Labrador.

Intensity-Duration-Frequency Curves

Climate change may cause more or less precipitation in specific locations. The best way to understand potential future trends is through a rainfall intensity-duration-frequency curve - more commonly referred to as an "IDF curve". This tool, based on statistical analysis of past rainfall patterns, can estimate the likely intensity, duration and frequency of future rainfall events. This tool is utilized globally by governments, engineers and the construction industry to design infrastructure such as roads and bridges to appropriate standards. In the absence of an IDF curve, the specifications for infrastructure may be too high, which increases costs unnecessarily, or too low, which may present challenges in heavy precipitation. In Canada, the federal government has traditionally provided IDF curves to provinces and territories. The Provincial Government is committed to working with the Federal Government to ensure that IDF curves are up-to-date and that local decision makers have timely access to the right information to develop the province's infrastructure.

Battle Harbour, NL
Image Source: Shirley Walsh

Integrating Adaptation into Decision-Making

- Continue to implement the ACAS project and partner with Municipalities Newfoundland and Labrador and Professional Municipal Administrators to roll out the findings to all communities.
- With a $600,000 annual investment over three years through Budget 2011, establish new flood risk maps for at-risk locations and, where it is possible to predict flooding, alert systems to notify government, communities and emergency response personnel of potential flooding. The new maps will incorporate climate change predictions to enhance their ability to support informed decisions and community planning.
- With a $100,000 annual investment over three years through Budget 2011, establish a new Coastal Erosion Monitoring and Mapping

Program and make the data and reports available through the Newfoundland and Labrador Water Resources Portal and other publications.

- Continue to include consideration of climate change implications (e.g. potential for flooding) in the site selection and design of Provincial Government buildings and infrastructure and extend these considerations to those receiving public funding.
- Continue to implement and enforce the Land Use Policy for Flood Risk Areas.
- Analyze opportunities to incorporate climate change considerations into community planning efforts, with a view to identifying opportunities for synergies across planning processes and minimizing administrative burden.
- Continue to support communities in their preparation of Emergency Management Plans, which are due by May 2012.

4.1. Climate Change in Northern Labrador

In the Northern Strategic Plan, the Provincial Government recognized the need for targeted action to address climate change in northern Labrador and committed to prepare a dedicated strategy on adaptation for the region. Northern areas across the globe are experiencing the most significant impacts, including reduced ice conditions, unstable and thawing permafrost, and changes in wildlife and vegetation. Impacts in the north are of considerable interest to southern regions, as they provide indicators of future potential changes.

There are many signs of climate change in northern Labrador and these impacts will present challenges for communities if they become the long-term norm. For example, winter sea ice in northern Labrador has been trending lower for years and the area experienced historically low conditions in the winter of 2009 and below normal patterns in 2010. This presents new challenges for communities, as the sea ice forms part of the winter highway for some coastal

Nain, NL
Image Source: Department of Tourism, Culture and Recreation

Labrador residents and directly connects communities and individuals to traditional hunting grounds, wood and country food sources that are important for public health, community sustainability, and local culture. Further study is needed over time, but the trends follow those of the greater Arctic. For example, the U.S. National Snow and Ice Data Centre recently issued a news release stating that January 2011 set a record low for Artic sea ice for that month. The news release also stated that sea ice in the broader north was “unusually low” and the Labrador Sea was found to be completely ice free.

Change in winter sea ice is one of the most important and dramatic impacts in northern Labrador, but there are other changes that can affect the region and its communities, including:

- Thawing permafrost, which can impact infrastructure and community development.
- Variability in snowfall and snowmelt, which can affect run-off, water quality and flood risk.
- Changes in temperature, precipitation and seasons, which can affect fish, seals, terrestrial wildlife, such as Caribou, and other country food sources, such as berries.

The Provincial Government is committed to working to improve the resilience of northern Labrador to climate change and recognizes that its province-wide objectives outlined in the previous section must be, at times, customized for northern Labrador's unique circumstances. Good cooperation and information sharing is particularly important, as there are multiple entities already working actively on adaptation in northern Labrador including the Nunatsiavut Government, the Innu Nation, the Federal Government and researchers from a variety of institutions such as Memorial University and the Labrador Institute.

Equally, there are unique aspects to adaptation in northern Labrador relating to traditional knowledge and lifestyles which offer opportunities to broaden and deepen understanding of how the climate is changing and what it means for communities.

Adaptation in Northern Labrador – Actions to Date:

The Provincial Government, in particular the Department of Environment and Conservation, has worked to strengthen adaptation in northern Labrador, including:

- Through the ACAS program, partnered with Memorial University to undertake a community-level vulnerability assessment with the community of Nain, as well as the development of case studies on adaptation in the north.
- Established targeted working groups with the Nunatsiavut Government and Innu Nation to enable an ongoing dialogue on climate change adaptation and the identification of opportunities for collaboration. These relationships are a fundamental component of understanding community-level impacts of climate change and identifying ways forward that are relevant to communities.
- Supported forums including the Climate Change and Renewable Resources conference hosted by Memorial University and the Labrador Institute in 2008. Based on the priorities of this conference, the Department of Environment and Conservation provided funding to develop a searchable, internet database of climate change-related research in Labrador and a community-based Observer Program for individuals to report their observations of climate-related changes on the land.
- Supported the Nunatsiavut Government's Tukisinnik Community Research Forum in June 2010 which was designed to improve collaboration amongst communities, researchers and governments, as well as to understand ongoing research and identify research priorities for northern Labrador.
- Funding research on the important role that cultural identity and values play in guiding community actions around climate change adaptation, decision-making and building local capacity.
- Partnering with the Nature Conservancy of Canada to develop the Conservation Blueprint for Labrador. This project, funded through the Northern Strategic Plan, will provide baseline data and a redefinition of Labrador's natural region boundaries to support planning, long-term biodiversity conservation and climate change adaptation.
- Conducting a multi-year sampling of lake trout in three northern Labrador lakes. The purpose of this study is to assess the impacts of warming lake water temperatures on the size, survival and reproduction of lake trout and long-term effects on lake trout populations.

Torngat Mountains, NL
Image Source: Chris P. Sampson

Actions Going Forward – Climate Change Adaptation in Northern Labrador:

The Provincial Government's future directions on climate change adaptation in northern Labrador will be long-term, collaborative in nature and guided by an overarching objective to strengthen the relationships with the Nunatsiavut Government, the Innu Nation and the research community on climate change adaptation in northern Labrador. Working through these relationships, the Provincial Government will apply its previously outlined priorities on adaptation to northern Labrador and also:

- Identify ways to better engage northern Labrador communities on issues pertaining to climate change adaptation.
- Promote best practices in community development in the north through appropriate planning and building practices to support long-term sustainability.
- Identify ways in which decision-making tools on climate change in northern Labrador could be improved, such as climate observation networks, flood risk mapping and information on local ice conditions.
- Identify research needs on climate change in northern Labrador and work with other partners to consider the best way to address them.
- Share expertise and information with a view to supporting the shared future directions and plans of the Nunatsiavut Government, Innu Nation and Provincial Government.

Battle Harbour, NL
Image Source: Shirley Walsh

5

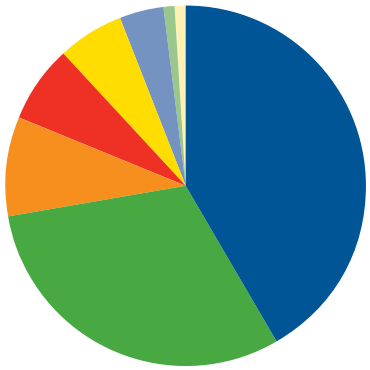
A SHARED CHALLENGE

Reducing Greenhouse Gas Emissions in Newfoundland and Labrador

5.0 A SHARED CHALLENGE – REDUCING GREENHOUSE GAS EMISSIONS IN NEWFOUNDLAND AND LABRADOR

The latest science makes clear that the rise of GHG emissions in the atmosphere is impacting the world's climate and causing it to warm. As a result, nations around the world are working to reduce GHG emissions to avoid the worst potential impacts and realize economic opportunities such as clean energy development. Without international effort to reverse the growth in GHG emissions, concentration levels will continue to rise. The extent of future warming will therefore be strongly dependent on the quantity of GHG emissions released into the atmosphere in the coming decades. To avoid dangerous climate change, the IPCC advises that global emissions must peak by 2015 and fall by between 50-85 per cent below 2000 levels by 2050.

Figure 1: Newfoundland and Labrador GHG Emissions by Sector, 2009



Large Industry	42%
Transportation (excluding off-road)	31%
Power Generation	9%
Waste	7%
Commercial & Institutional	6%
Residential	4%
Manufacturing	<1%
Forestry, Agriculture & Construction	<1%

Source: Estimated from Environment Canada data, 2011.

Gros Morne, NL
Image Source: ©Barrett & MacKay Photo, courtesy of the Department of Tourism, Culture and Recreation

Developed countries are primarily responsible for the current levels of GHG emissions in the atmosphere, but a new and challenging dynamic is the GHG growth that is occurring in developed countries such as China, Brazil and India as they grow their economies. All jurisdictions have a role to play in reducing GHG emissions and the Provincial Government has committed to play its part.

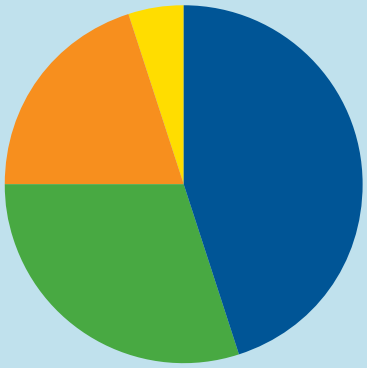
In 2009, the most recent year with available data, GHG emissions in Newfoundland and Labrador were 9.5 Mt, which equates to a 2.7 per cent increase over 1990 levels. The largest sources of GHG emissions in the province were large industry (42 per cent), transportation (31 per cent), power generation (9 per cent) and waste (7 per cent). Much of the growth in Newfoundland and Labrador's GHG emissions since 1990 can be attributed to the strong economic growth experienced in the offshore oil sector and other large industries.

GHG Emissions by End User in Newfoundland and Labrador - In the National Inventory Report, Environment Canada provides estimates of industry and sectoral-level GHG emissions. This includes estimates for stationary combustion sources (e.g. buildings, oil platforms and mines), transportation, fugitive emissions (e.g. offshore gas flaring), industrial processes and waste.

Using a Statistics Canada national methodology and Environment Canada data, provincial-level estimates of emissions can be developed for individuals, small and medium-sized businesses, large industrial facilities and government. These estimates include all the GHG emissions that each of these groups is responsible for. In other words, it not only includes the emissions associated with direct energy use (eg. home heating oil), it also includes indirect energy use (eg. electricity from the grid), transportation and waste emissions. This differs from Figure 1 where emissions from transportation, waste and electricity generation at Holyrood are not attributed to those who actually undertake the travel, generate waste, or use the electricity, but are presented separately by category as per the National Inventory Report. In contrast Figure 2 gives an idea of the total contribution of different groups' activities to provincial GHG emission levels.

For this province, large regulated facilities are estimated to account for 45 per cent of total provincial emissions in 2009, individuals for 30 per cent, small and medium-sized businesses for 20 per cent, and government for 5 per cent.

Figure 2: Newfoundland and Labrador GHG Emissions by End User, 2009



Source: Estimated from Environment Canada data, 2011.

Newfoundland and Labrador is responsible for 1.4 per cent of GHG emissions in Canada. The province has the second lowest overall GHG emissions among provinces, but is fifth among provinces in terms of per capita emissions due to its large resource-based economy and relatively small population.

The Provincial Government has worked actively through multiple forums such as the Conference of New England Governors and Eastern Canadian Premiers (NEG-ECP) to take collaborative action on climate change. The NEG-ECP comprises five Premiers (the four Atlantic provinces and Quebec) and six U.S. Governors (Massachusetts, Connecticut, New Hampshire, Vermont, Rhode Island and Maine).

It has committed to reduce GHG emissions and established regional reduction targets that are:

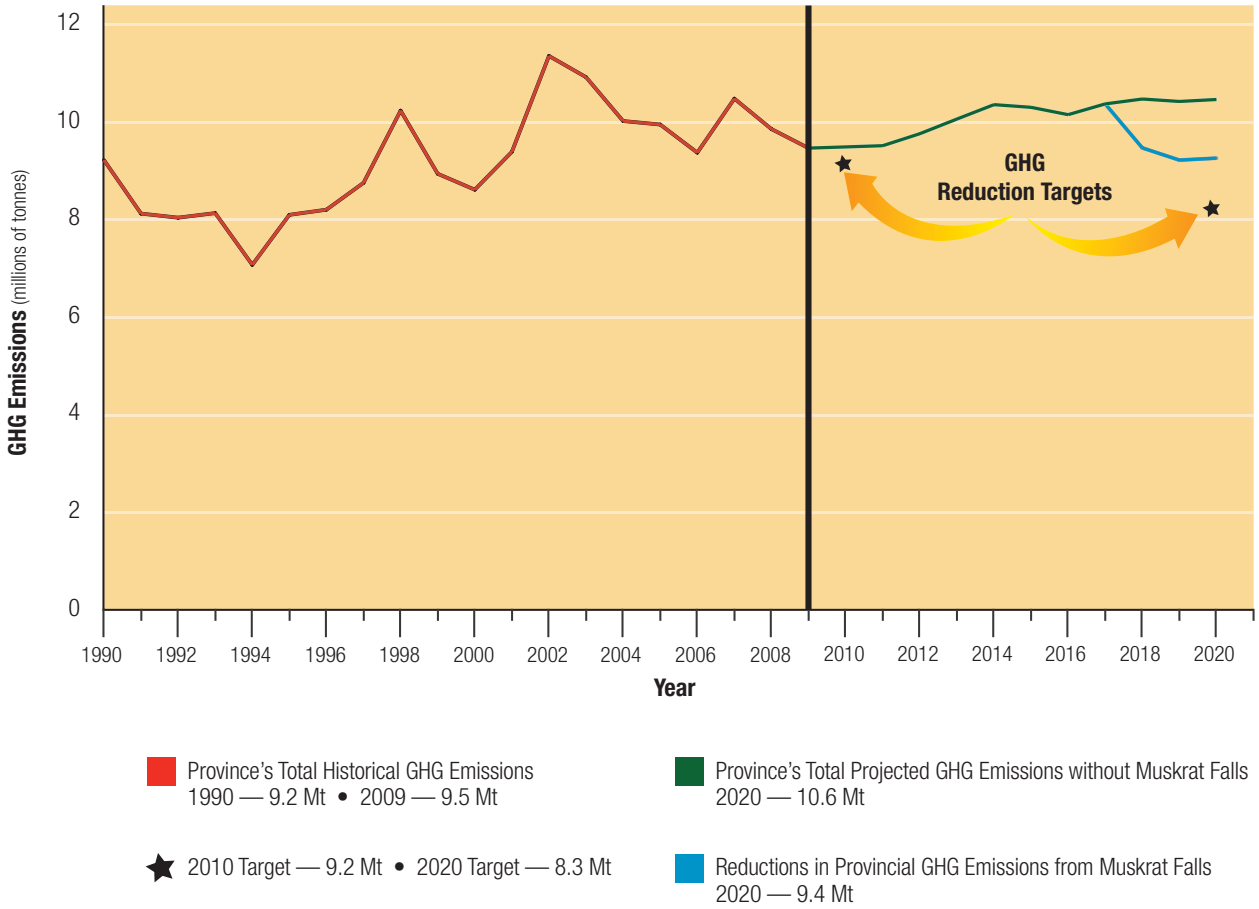
- To reduce regional GHG emissions to 1990 levels by 2010;
- To reduce regional GHG emissions to 10 per cent below 1990 levels by 2020; and
- To reduce regional GHG emissions to 75-85 per cent below 2001 levels by 2050[2].

In the 2007 Energy Plan, the Government of Newfoundland and Labrador committed to pursue these targets on a provincial basis and it reaffirms this commitment to this Climate Change Action Plan.

[2] Information is not yet available to determine whether the NEG-ECP has achieved its 2010 regional reduction target.

Current projections by the Provincial Government for the year 2020 show that, in the absence of any new measures to control GHG emissions, provincial emission levels will continue to grow and the province will not meet the 2020 target. This is because other major developments in the province, such as Hebron offshore oil development, will increase GHG emissions while generating economic growth and employment. Against this backdrop and the fact that over 85 per cent of the province's electricity is currently generated from renewable energy, reducing emissions in line with the NEG-ECP target on a provincial basis will be demanding. However, the government remains committed to the NEG-ECP targets. The targets are intended to be challenging and they are designed to motivate action and raise levels of ambition. The Provincial Government is committed to ensuring this province does its part to tackle climate change and that the actions taken are both environmentally sustainable and economically prudent. Government aims to maximize opportunities such as the development of Muskrat Falls and, in the longer term, Gull Island.

Figure 3: Historical and projected GHG emissions in Newfoundland and Labrador, 1990-2020 (millions of tonnes, Mt)



Source: Historical emissions taken from Environment Canada; projections based on internal analysis.

The publication of this document and the commitments within it represent an important milestone as the province moves forward. This Action Plan articulates what further action the province intends to take to reduce GHG emissions over the next five years. A key premise of this effort is that action is required by every part of society and by all sectors. However, this plan is not the end of the story. Beyond the 2020 target, the NEG-ECP has committed to a 2050 target to reduce GHG emissions levels by between 75-85 per cent below 2001 levels. As such, government recognizes that further steps will be needed to address this long-term challenge. The NEG-ECP region is not alone in committing to long-term targets of this magnitude, as this is what the science indicates is necessary.

Example GHG Reduction Targets for 2050

Jurisdiction	2050 Target
Ontario	80% below 1990 levels
British Columbia	80% below 2007 levels
Nova Scotia	80% below 2009 levels
California	80% below 1990 levels
Washington	50% below 1990 levels
European Union	80-95% below 1990 levels
Australia	80% below 2000 levels

Source: Information from respective jurisdiction's climate change plans.

Additional actions to meet the province's targets will continue to be identified as this plan is implemented. It is clear that deep reductions will require a major transformation and that research and development into new technologies will play a key role, as well as the deployment of existing solutions including fuel-switching to hydroelectricity and promoting greater energy efficiency. It will also require ongoing collaboration with other jurisdictions and the Federal Government in a bid to identify how government can, in partnership, drive the changes needed while maximizing the opportunities and minimizing risks. Government will be monitoring its progress towards delivering the commitments in this plan as well as continuing to identify further ways to make progress.

5.1 Leading by Example – Provincial Government Action

The Provincial Government has a unique and important role to play in the province's efforts on climate change. Through the publication of this plan and the companion document Moving Forward: Energy Efficiency Action Plan 2011, the Provincial Government has set out a vision for the future that is supported by a clear pathway forward and 75 action-oriented commitments. Government will now drive forward with the implementation of these commitments, with a view to promoting engagement by all parts of society. While developing and delivering against this plan is one key role for government, leadership must also extend to how government conducts its own operations and ensuring this is done in a manner consistent with this plan and that on energy efficiency.

During the consultations on climate change and energy efficiency in the spring and summer of 2010, participants agreed that the Provincial Government should lead by example in reducing GHG emissions and improving energy efficiency. The operations of the Provincial Government are extensive and government is committed to continue to identify how it can reduce its GHG footprint while maintaining public services and, where possible, lowering government's operating costs. For example:

- *Buildings*: The government owns 840 buildings with approximately 600,000 m² of floor space and departments lease over 90,000 m² throughout the province. Government also constructs a number of new buildings on a regular basis and provides funding for municipalities to do the same. This presents opportunities to identify energy savings and utilize modern construction and management techniques to reduce operating costs and improve the quality of the building environment.

- *Employees*: The Provincial Government, including its agencies, boards and commissions has over 45,000 employees, and there is an opportunity to engage this community of professionals to lower the overall footprint of the Provincial Government by, for example, web conferencing in place of travel or turning off appliances when not in use, and using only two-sided printing on recycled paper.
- *Waste:* The operations of the Provincial Government can generate significant volumes of waste. With new or pending waste management infrastructure throughout the province, supported through government's Solid Waste Management Strategy, there are more opportunities to recycle, compost and generally reduce waste.

In addition to the potential for GHG reductions in its own operations, the Provincial Government has the capability to establish broader policy and strategic frameworks to generate action across the economy. Important aspects of this include the efficient and effective delivery of programs and services, giving strategic consideration to whether public procurement policies and other government initiatives can help to transform markets for energy-efficient products and services, and ensuring that high-quality information is made available in a timely fashion to promote energy efficiency within the province. The Provincial Government is committed to strengthening the framework for action in Newfoundland and Labrador to facilitate shared and collaborative action on climate change.

Government-owned heavy truck, water bomber, and the Grace Sparkes Ferry
Image Source: Department of Transportation and Works

- *Fleet*: The Provincial Government owns over 3,000 vehicles, which include light vehicles, heavy equipment and utility vehicles. This presents opportunities for fuel and cost savings.
- *Procurement*: In 2009-10, government purchased over $1 billion in goods and services. This can present opportunities to support the climate change agenda by purchasing items with low carbon footprints, including high-efficiency appliances and equipment.

Initiatives to Date – Provincial Government Action:

The Provincial Government has exercised its leadership potential on climate change and has developed plans and programs to advance action on climate change. It has also implemented a variety of initiatives across its own operations consistent with the goals of this plan. Some examples of actions to date include:

Framework for Action

- In the 2005 Climate Change Action Plan and 2007 Energy Plan, the Provincial Government established its strategic framework to move forward on climate change in the province.

These comprehensive plans have been complemented by extensive collaboration through intergovernmental forums such as the Council of the Federation.

- In 2008, the Provincial Government became a member of the Climate Registry, fulfilling a commitment made by Premiers at the 2007 Council of the Federation meeting. The Climate Registry is a non-profit entity that sets consistent and transparent standards to calculate, verify and publicly report GHG emissions. All provinces in Canada are members of the Climate Registry.
- In 2009, then Premier Danny Williams attended the Governors Global Climate Summit in Los Angeles. This summit, hosted by the Governor of California and co-chaired by several other Governors, brought together sub-national leaders from around the world to chart a way forward on climate change. The event culminated with the signing of a declaration by 30 global leaders on a shared commitment to act on climate change.

Buildings

- Building upon a commitment in the 2007 Energy Plan, the Build Better Buildings Policy requires that all new government-owned or government-funded buildings and major renovations exceed the 1997 Model National Energy Code for Buildings by 25 per cent and, where practical, qualify for Leadership in Energy and Environmental Design (LEED) Silver status. A number of new government buildings have been built to LEED standards including new schools in Torbay and Paradise and the long-term care facility in Corner Brook.

Corner Brook Long-Term Care Facility

On October 26, 2005 then Premier Danny Williams turned the sod on the site of the Corner Brook Long-Term Care Facility. Not only has the building been designed to meet government's commitment to enhancing the long-term care and accommodations for seniors in the region, it has also been designed to meet energy efficiency standards in its day-to-day functions.

The long-term care facility has been designed to exceed the standards of the 1997 Model National Energy Code for Buildings and to achieve silver status under the LEED program.

Key features of the building include:

- Energy-efficient lighting such as fluorescent lamps with electronic ballasts and lighting controls with occupancy and daylight sensors.
- Heating from a ground source heat pump system.
- HVAC systems comprising high-efficiency fans modeled with an increased pressure drop to account for the added resistance associated with the heat recovery.
- Efficient water consumption through low-flow fixtures such as faucets and showers.

Corner Brook Long-Term Care Facility, NL
Image Source: Department of Transportation and Works

The benefits include (relative to a building constructed to traditional standards):

Anticipated Annual Reduction in Energy Use:	**52.5%**
Anticipated Annual Energy Cost Savings:	**55.6%**
Anticipated Annual Energy Cost Savings:	**$269,000**

Leadership in Energy and Environmental Design (LEED) – LEED is an internationally recognized third-party certification program for the design, construction and operation of high performance green buildings. It provides building owners and operators with the tools they need to have an immediate and measurable impact on their buildings' performance. With four possible levels of certification (certified, silver, gold and platinum), LEED is flexible enough to accommodate a wide range of green building strategies that best fit the constraints and goals of particular projects. Source: Canada Green Building Council

- Energy audits and engineering studies have recently been conducted on several large buildings in the Avalon region, including the Confederation Building. These efforts identified vast amounts of potential energy savings and they form the basis of many ongoing efforts to upgrade buildings.
- The Provincial Government has successfully implemented the BOMA BESt building management certification process on the Natural Resources Building in St. John's. In May 2011 the Department of Transportation and Works received an award from BOMA Newfoundland and Labrador for the Natural Resources Building as it received the highest level of certification of any building in the province for the year.

Newfoundland and Labrador Green Fund – Support for Public Sector Projects

The Newfoundland and Labrador Green Fund, delivered by the Department of Environment and Conservation, is a three-year $25 million program cost-shared with the Federal Government. It supports a wide range of climate change and GHG reduction efforts, including energy efficiency projects, small-scale wind turbines, a district heating study, biofuel and methane capture projects. Projects that have been supported in the public sector include:

- Funding for the Robin Hood Bay Regional Waste Management Facility to implement methane capture and flaring technology. This project has the potential to reduce GHGs by 50,000-60,000 tonnes per year.
- Funding to support the new Corner Brook City Hall construction. The building design incorporates environmental features such as a green roof and a "Window on the World" building performance system, which publicly displays the building's energy performance. The building is expected to save approximately 500 tonnes of GHGs per year.
- Funding for several new schools, such as the Torbay K-6 School. With energy savings measures, particularly the use of a Ground Source Heat Pump System, this school is expected to save over 1,000 tonnes of GHG emissions per year versus a standard building.
- Support for energy efficiency upgrades to Provincial Government buildings, including lighting retrofits, the installation of occupancy sensors and modifications to central control systems at the Confederation Building.

BOMA BESt – The Building Owners and Managers Association (BOMA) Building Environmental Standards (BESt) program is a national initiative launched in 2005 by BOMA Canada. It was created to address an industry need for realistic standards for the energy and environmental performance of existing buildings based on accurate, independently verified information. Today, BOMA BESt has evolved from simply identifying key best practices to providing: (i) common standards; (ii) an array of educational and on-line assessment tools; (iii) independent data audits; and (iv) a performance certification program.

On May 17th, 2011 the Department of Transportation and Works received official recognition for the first BOMA BESt certified provincial government building. The Natural Resources Building, located at 50 Elizabeth Avenue, St. John's, was awarded one of the highest levels of BOMA BESt certification (Level 3) and is currently the only building in the province certified to this level. As a result of this high level of achievement, the Natural Resources Building also received BOMA Newfoundland and Labrador's Earth Award, which is given to the building in the province which has achieved the highest level of BOMA BESt certification for the year.

Department of Natural Resources Building, St. John's, NL
Image Source: Department of Transportation and Works

- The Provincial Government has launched the Save It Forward program in provincial schools to increase awareness and positive attitudes towards energy conservation and efficiency. Through this program, students and teachers can spearhead initiatives that promote greater energy conservation and efficiency.

Transportation

- Since April 2008, 41 per cent of the Provincial Government's new car and SUV purchases have been hybrid vehicles. This exceeds the commitment made in the Energy Plan that 25 per cent of all new car and SUV purchases be energy-efficient or hybrid vehicles. These vehicles, 31 since April 2008 (38 in total), are spread out across the province in eight government departments.
- Government maintains clean air anti-idling zones around public buildings, which reduce GHG emissions and generate fuel-savings for vehicle owners.

"Clean Air Zone" outside Confederation Building, St. John's, NL
Image Source: Office of Climate Change, Energy Efficiency and Emissions Trading

Actions Going Forward – Provincial Government Action:
The Provincial Government acknowledges the importance of leading by example and recognizes that more can be done within its own operations. Commitments going forward include:

Framework for Action

- Develop a public awareness campaign on climate change and energy efficiency with initial funding of $250,000 from Budget 2011. This campaign will promote a better understanding of climate change and energy efficiency, including the actions that people in all sectors of the economy can take.
- Develop an action plan setting out the practical steps government plans to take to green government going forward.

- Explore the potential to utilize the government's procurement power to promote greater energy efficiency, lower GHG emissions and reduce waste.
- Explore the best way to ensure that individuals and businesses have access to the right information and tools to move forward on energy efficiency.
- Develop an action plan outlining government's role in transforming markets for more energy-efficient and low GHG-emitting goods and services.
- Continue to implement the Green Fund in 2011-12 and conduct an evaluation of its impact and effectiveness.
- Examine ways to enhance the delivery of energy efficiency programs across government.

Buildings

- Continue to implement the Build Better Buildings Policy.
- Conduct energy audits on government buildings in 2011-12, and complete energy audits on all remaining buildings over 1,000 square meters that have not previously been audited within the next five years.
- Develop retrofit plans for cost-effective energy efficiency upgrades that were identified in the energy audits.
- Roll out the BOMA BESt building management certification process to other government office buildings, following the successful application to the Natural Resources Building.
- Explore the potential for green leasing requirements for space that the Provincial Government leases from other building owners.
- Continue to implement the Save It Forward program in the province's schools.

Transportation

- Establish a target that 35 per cent of all new car and SUV purchases be energy-efficient or hybrid vehicles for departments, agencies, boards and commissions. This builds on the 25 per cent target from the Energy Plan.

Green Leasing

A green lease is one that incorporates environmental sustainability principles and practices in the management and occupation of a building. The Federal Government is implementing a "green leasing" policy through which it will require a high level of energy performance at its leased properties. Beginning in April 2012, new and renewal leases will require environmental certification from programs such as LEED and BOMA.

5.2 Households

The majority of GHG emissions from households are a result of energy use for space and hot water heating, lighting and appliances, so energy efficiency remains the predominant approach to reducing GHG emissions. Focused approaches are needed for both new and existing homes. New homes are becoming more energy efficient over time and this is having an impact on energy demand in the province. For example, the total amount of energy used by the housing sector has declined since the early 1990s by approximately 17 per cent, while the total volume of housing stock has increased by 19 per cent. Despite this, there are further opportunities to reduce GHG emissions and lower household fuel bills through, for example, enhancements in building practices and using more efficient appliances. The same holds true for existing homes, which can benefit from retrofits that may, for example, increase insulation, eliminate drafts, or add energy-efficient windows.

In Canada, there are many collaborative efforts occurring among the federal, provincial and territorial governments to improve energy efficiency in households. For example, governments are currently working to update the 1997 Model National Energy Code for Houses and the new version is expected to form part of the National Building Code in the fall of 2012. Newfoundland and Labrador requires that municipalities adopt the National Building Code through the *Municipalities Act, 1999*, and

the inclusion of the new Model National Energy Code for Houses into the National Building Code will provide a promising opportunity to improve the energy efficiency of homes in future years.

Initiatives to Date – Households:

Progress has been made through a number of initiatives aimed at the household sector. These include:

- EnerGuide for Houses Program – The Department of Natural Resources provides $300 (plus HST) against the cost of a home energy audit and up to $1,500 to support a number of retrofits to an existing home. In April 2010, the Provincial Government announced that these programs would continue despite the fact that the Federal Government did not renew its ecoEnergy Retrofit - Homes Programs for the 2010-11 financial year. However, the Federal Government has since provided a one-year renewal of the program for 2011-12 through Budget 2011.
- Residential Energy Efficiency Program – The Newfoundland Labrador Housing Corporation maintains this program, providing lower income homeowners with funding to support retrofits to their homes. The program provides up to $3,000 to island residents, and up to $4,000 to residents in Labrador, and has benefitted approximately 1,000 homes per year. The results from the first two years of the program were positive, with average energy savings of approximately $800 annually achieved in retrofitted homes.
- Phase One of the Coastal Labrador Energy Efficiency Pilot Project - The Provincial Government has concluded Phase One of Coastal Labrador Energy Efficiency Pilot Project in the Labrador communities of Port Hope Simpson and Hopedale. In partnership with Newfoundland and Labrador Hydro, teams of energy efficiency assessors provided information and a kit of low-cost energy efficiency technologies (e.g. compact fluorescent light bulbs, weather stripping and window insulation) to households and business owners.

In addition to the actions taken by the Provincial Government, Newfoundland and Labrador Hydro and Newfoundland Power maintain the takeCHARGE program which provides customers with rebates for the installation of insulation, energy-efficient windows and high efficiency or programmable thermostats.

Action Going Forward – Households:

Energy efficiency remains a key means of helping households take action on climate change. The Provincial Government will pursue several new initiatives including:

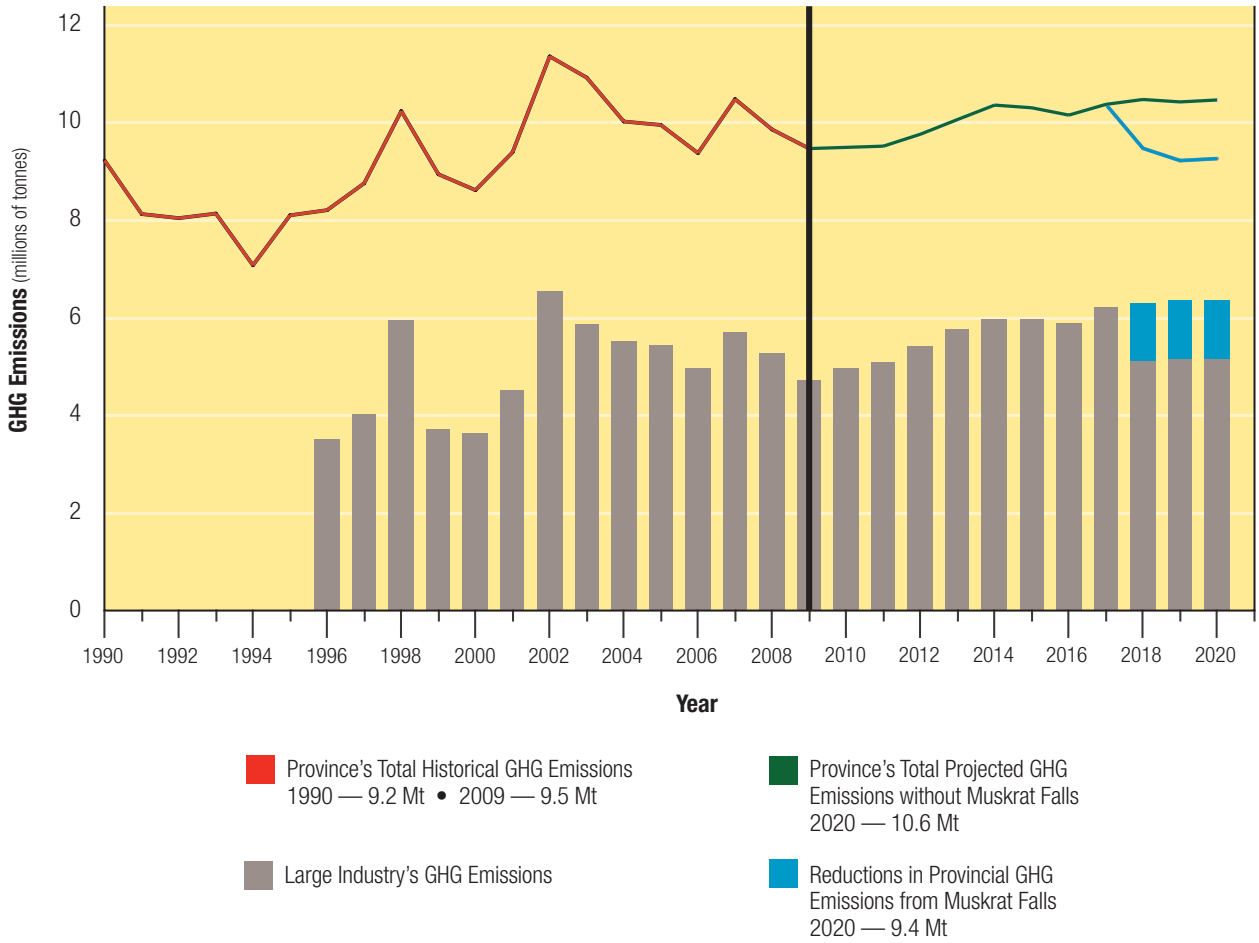
- Renew the Residential Energy Efficiency Program with an investment of $12 million over three years through Budget 2011.
- Continue to support the implementation of the EnerGuide for Homes Program.
- Work with other provinces and territories and the Federal Government on the development of long-term federal funding arrangements for residential energy efficiency retrofits.
- Launch Phase Two of the Coastal Labrador Energy Efficiency Pilot Program in two new Labrador communities and evolve the delivery model to increase the uptake of available energy efficiency programs in these communities and those visited in Phase One.
- Pilot a Building Construction Plan Energy Efficiency Advice Service for housing contractors and home-owners seeking to improve the energy efficiency of their building designs during the planning stage.
- Collaborate with other provinces, territories and the Federal Government on the development of new energy codes, energy-efficient product standards and more informative labelling.
- Work with municipalities to ensure that they are aware that the new Model National Energy Code for Houses will be incorporated into the National Building Code in 2012 and assist them to prepare for this change.

5.3 Large Industry

In the 2007 Energy Plan, the Provincial Government committed to develop a GHG Strategy for the Energy-Intensive Sector, recognizing the level of GHG emissions they release in the province. This sector currently comprises five sub-sectors, namely, electricity generation, mining, newsprint, offshore oil, and oil refining, across which there are currently nine entities operating in the province: Newfoundland and Labrador Hydro's thermal generating station at Holyrood, Iron Ore Company of Canada, Vale Inco, Wabush Mines, Corner Brook Pulp and Paper, the three offshore oil operations (Suncor, Husky and ExxonMobil), and North Atlantic Refining Limited.

In 2009, these companies were estimated to utilize 40 per cent of energy consumed in the province, and account for 50 per cent of provincial GHG emissions (42 per cent excluding the Holyrood thermal generating station). GHG emissions from this sector are expected to grow over time and, excluding Holyrood which is expected to be decommissioned with the development of Muskrat Falls, the sector is anticipated to account for 49 per cent of provincial emissions by 2020. This growth is the result of new industrial developments such as the Hebron offshore oil development, the Vale hydromet facility, new mining developments in Labrador West and expanded operations at Iron Ore Company of Canada.

Figure 4: Total historical and projected GHG emission levels in Newfoundland and Labrador with large industry share, 1990 - 2020 (millions of tonnes, Mt)



Source: Historical data from Environment Canada; projections based on internal analysis.

There are, however, important cost and competitiveness considerations when determining a way forward for this sector. These industries account for approximately 5 per cent of direct employment and about 30 per cent of GDP, and were the major driver of the 55 per cent growth in real GDP since 1990. Further, most of these firms operate internationally and are price takers in global commodities markets, so it is imperative that any approach be balanced to advance progress on climate change while promoting strong economic activity and investment.

Initiatives to Date – Large Industry:

Since the Energy Plan was released, progress has been made in a number of areas affecting the energy-intensive sector. These include:

- Newfoundland and Labrador Hydro has implemented an Industrial Energy Efficiency Program to assist large industrial operations identify opportunities for energy efficiency. Through this program, industrial firms receive financial support for an energy audit, the preparation of feasibility studies for upgrades from the audit, and up to $500,000 towards the implementation of electricity-saving measures.
- The province has developed two wind projects that are connected to the grid on the island portion of the province, in St. Lawrence and Fermeuse, with a total capacity of 54 MW. This clean energy reduces GHG emissions in the province by about 140,000 tonnes annually by displacing oil-fired electricity from Holyrood.
- The Provincial Government has been actively engaging the large industrial firms in a dialogue on the climate change agenda. These discussions have been intended to generate a mutual understanding of each other's perspectives, to identify the potential for "win-win" opportunities which meet economic and environmental goals, and to help chart a prudent path forward with a view to reducing GHG emissions while simultaneously strengthening firms' long-term competitive position in a carbon-constrained world.

Wind turbines in Fermeuse, NL
Image Source: Nalcor Energy

- In 2010, the Provincial Government commissioned a modeling study to assess the impacts of carbon pricing on each sector of the economy (see text box in section 3.4). The high-level conclusions are that, in a carbon-constrained environment in which a price is placed on GHG emissions, fuel-switching to cleaner energy sources and energy efficiency are the most promising and cost-effective opportunities for emissions reductions in the industrial and commercial sectors. A copy of this study can be found at: http://www.exec.gov.nl.ca/exec/cceeet/publications/index.html.

In addition to actions by government, Newfoundland and Labrador Hydro has implemented initiatives to reduce GHG emissions from remote electricity generation. This includes the development of the world's first completely isolated wind-hydrogen-diesel electricity generation project in the community of Ramea and the completion of phase one of a study into potential sources of alternative energy in seven coastal Labrador communities. While these reductions do not directly impact GHG emissions from the Holyrood Generating Facility (the only facility included in the GHG figures for large industry), they support the province's vision support of a clean energy future as they displace diesel generation in these communities.

Newfoundland and Labrador Hydro and Newfoundland Power have partnered in the development of a net-metering policy for customers who wish to develop alternative energy sources on a small scale. This will enable customers to produce power for themselves and have the ability to feed back some of the power into the electricity system when they produce more than they need.

Wind turbines in Ramea, NL
Image Source: Nalcor Energy

Ramea Wind-Hydrogen-Diesel Energy Project

In Ramea, an island community off the south coast of Newfoundland, excess power will be stored as chemical energy in the form of hydrogen. When it is windy, electrolysers will produce hydrogen for storage and, when it is calm, a hydrogen engine will convert the hydrogen back to electricity. The power consumption of the islanders varies, but the stored hydrogen will ensure that sufficient renewable power can be generated at any time – even when consumption is high and wind activity is minimal. As a first demonstration community, the efficient and cost-effective integration of wind power, hydrogen and diesel will be analyzed before the technology is rolled out to new communities are added. Ramea will be a model for the hydrogen economy.

Actions Going Forward – Large Industry:
The Provincial Government remains committed to working with the sector to determine an appropriate path forward on climate change that takes account of economic realities. To achieve this desired outcome the Provincial Government will:

- Pursue the development of the Muskrat Falls hydroelectric project and, through an interconnect with the island of Newfoundland, eliminate 1.2 Mt of GHG emissions from the Holyrood Generating Station.
- Develop, and publicly release in 2012, a detailed approach for the energy-intensive sector on climate change. This approach will include a GHG reduction target for the sector. The development of policies will be guided by 11 core principles:

1. Contribute to provincial GHG reduction targets - In view of the percentage of GHG provincial emissions coming from this sector, the province will require this sector to contribute to GHG reduction efforts if it is going to meet its targets.

2. Encourage economic development - The large industrial firms are major contributors to employment and economic activity in the province, and will be far into the future. The policies must find ways to support and sustain this activity, while achieving climate policy goals.

3. Take account of trade-exposed nature of energy-intensive sector - The firms in this sector are largely price takers in international markets, and consideration must be given to avoid any competitive distortions that could arise through the design of a policy framework for these companies.

4. Provide greater long-term certainty for industry - The global economy will become increasingly carbon constrained over the coming years and decades, but uncertainty about government's approach to address climate change creates risk for companies.

5. Prepare the energy-intensive sector for a carbon-constrained future - By elaborating the intentions of the Provincial Government in a detailed policy framework, firms in this sector will have the clarity to undertake longer-term planning and investment decisions in a manner most conducive to delivering cost-effective GHG reductions.

6. Support Lower Churchill Hydroelectric project - The Lower Churchill project is the most significant large-scale opportunity for GHG reduction in the province and region and it will generate significant economic benefits.

7. Accommodate the unique circumstances of the offshore oil and mining sectors - Offshore oil projects have limited options to fuel-switch to cleaner energy. Mining developments located in remote areas may also have limited options to access clean electricity. As a result, any provincial framework must provide cost-effective compliance mechanisms to accommodate such unique challenges.

8. Acceptable fiscal impacts on government - Achievement of the province's climate change policy goals must be balanced against the potential impacts that a new policy or regulatory approach could have on the provincial treasury.

9. Encourage new investment in the province - The policy approach for large industry must continue to support inward investment and utilize the province's unique attributes (such as the availability of large quantities of clean energy) to its advantage.

10. Stimulate green technology development and deployment and job growth - GHG reduction is often driven and facilitated by green technology, whether relating to the generation of energy, improving overall energy efficiency or reducing waste. Making progress on these fronts can support technology development and new job opportunities.

11. Pursue administrative efficiency and low transaction costs - The design of a policy approach must maintain a view to administrative efficiency to ensure that the transaction costs for business and government are reasonable.

- The Provincial Government will pursue three early actions to move forward with this sector as it develops its broader policy approach. These are:

1. Become a formal observer to the Western Climate Initiative - In addition to the 11 full members of the Western Climate Initiative, there are four provinces and territories (Nova Scotia, New Brunswick, Saskatchewan and Yukon Territory), six U.S. states and six Mexican states that maintain *observer* status. Observer status allows a jurisdiction to learn more about WCI's emissions trading scheme by attending meetings and receiving analysis on the policy and operational issues being developed by member jurisdictions, without the requirement to adopt the commitments that full members are making.

2. Apply Best Available Control Technology requirements in the Air Pollution Control Regulations to GHG emissions for new investments in the large industrial sector - Currently, the regulations apply only to local air pollutants such as sulphur dioxide, and require that an owner or operator who installs a new or modified emission source employ the best available control technology to limit emissions into the atmosphere. Government will extend coverage of these requirements to include GHG emissions. This will have the effect of promoting energy efficiency and reducing GHG emissions, and will be consistent with emerging approaches such as those being advanced by the U.S. Environmental Protection Agency.

3. Seek to influence federal policy as the Federal Government considers future polices and regulations to redue GHG emissions - The Federal Government has committed to bring forward regulations to reduce emissions in the energy-intensive sector but, with the exception of regulations for coal-powered generation to come into effect in 2015, no regulations have been brought forward. The Provincial Government will ensure that the Federal Government is aware of the unique circumstances of industrial facilities in Newfoundland and Labrador.

5.4 Small and Medium-Sized Enterprises

With almost 90 per cent of businesses in Newfoundland and Labrador employing less than 20 people (Statistics Canada, Business Register, 2008), small and medium-sized enterprises (SMEs) are integral to employment and economic growth in the province.

Firms in this sector can benefit from efforts such as fuel-switching and energy efficiency where it improves their bottom line and competitive position. For example, more and more companies are being asked to provide the "carbon footprint" of their product when entering new markets, as global supply chains are increasingly interested in the environmental impact of a product throughout its lifecycle – from production to disposal. Further, energy costs are often a significant expense for businesses and increasing attention is being paid to augmenting energy efficiency in buildings and production facilities and processes. Companies that take proactive measures to lower their carbon footprint and improve their efficiency will be best positioned to take advantage of opportunities in a low-carbon global economy.

What is a Carbon Footprint?

A "carbon footprint" measures the total GHG emissions generated by an organization, product, event, or an individual. It provides a means of calculating the impact on the environment from a climate change perspective. A carbon footprint helps promote understanding of the extent and source of GHG emissions, which is often the first step in identifying how best to reduce the size of a footprint going forward. There are four types of footprints:

1. Organizational - Captures emissions from all the activities across the organization, including building energy use, industrial processes and company vehicles. An organizational footprint can be developed for any establishment (e.g. businesses, schools, not-for-profit bodies, all levels of government and households).
2. Product - Captures emissions over the whole lifecycle of a product or service, from the extraction of raw materials and manufacturing, through to its use and final reuse, recycling or disposal.
3. Event - Captures emissions associated with organizing and running an event, which may include travel, the use of building space, and waste.
4. Individual - Captures emissions associated with a person's lifestyle, such as heating a home and transportation decisions.

The Government of Newfoundland and Labrador recognizes that this sector of the economy can face barriers to action, from having sufficient resources to implement energy efficiency measures to having the in-house expertise to take action. However, there are significant opportunities to capitalize upon and government is committed to working with businesses to promote action. This includes promoting awareness on climate change and energy efficiency and the programs that are available to them, and ensuring they have access to high-quality, timely and trusted information on opportunities for fuel-switching, and ways to improve their energy efficiency and reduce their carbon footprint.

The efforts of the Provincial Government for SMEs, as with other sectors, will be supported by intergovernmental collaboration. One promising area includes federal, provincial and territorial efforts to update the 1997 Model National Energy Code for Buildings, which will apply to buildings greater than 600 m^2. This is expected to be finalized by the fall of 2011 and will provide a means to improve the energy efficiency of new commercial buildings.

Initiatives to Date – Small and Medium-Sized Enterprises:

- The Newfoundland and Labrador Green Fund has supported a wide range of climate change and GHG reduction efforts, including energy efficiency projects, small-scale wind turbines, a district heating study, and biofuel and methane capture projects.

Newfoundland and Labrador Green Fund – Support for Private and Non-Profit Sector Projects

Some of the projects that the Newfoundland and Labrador Green Fund has supported in the business and not-for-profit sectors include:

- The installation of a combined solar and wind power generating and storage system for Flowers River Lodge in Labrador. The project has the potential to reduce GHGs by 52 tonnes per year.
- The installation of an anaerobic digester and a methane gas capture and utilization system to generate electricity for New World Dairy in St. David's. This system eliminates the need for 41,000 litres of furnace oil per year and has the potential to reduce GHG emissions by over 11,000 tonnes per year.
- The installation of a wind-powered energy system to replace diesel-generated electricity for Brother Brennan Environmental Education Centre in Deer Park. This project could reduce GHG emissions by 20 tonnes per year.
- The integration of LEED design principles into the construction of the new YWCA in St. John's. The building is intended to be 25 per cent more energy efficient than the Model National Energy Code for Buildings and is expected to reduce GHG emissions by 300 tonnes annually compared to a standard building.
- A retrofit project for the Stella Burry Community Services housing and resource centre in St. John's. The Green Fund contribution supported energy efficiency measures including a heat pump system, automated controls and setback thermostats, low E windows and additional insulation in the walls and roof. In its first year of operation, the project reduced energy costs by 30 per cent and provincial GHG emissions by 31 tonnes.

Stella Burry Building, St. John's, NL
Image Source: Greg Locke photo, courtesy of Stella Burry Community Service

- The Department of Innovation, Trade and Rural Development has helped SMEs improve competitiveness through a greater focus on energy efficiency, waste reduction and the adoption of green technologies and operations. This has included "Lean and Green" workshops, delivered through the Canadian Manufacturers and Exporters Newfoundland and Labrador, which provided training and on-site demonstrations to help businesses improve productivity and lower costs. These efforts have been complemented by an expansion of the department's Business Retention and Expansion diagnostic interview program which helps SMEs identify ways to lower their carbon footprint, improve energy efficiency and reduce waste.
- The Provincial Government is studying how best to position the provincial economy and its SMEs to take advantage of opportunities in the global 'green economy', estimated to be worth approximately $5.2 trillion U.S. (GLOBE Advisors, 2010).

Green Economy – A key priority for government is ensuring the province takes advantage of the economic opportunities associated with the global transition to a low-carbon economy and greater energy efficiency. Given this, the Provincial Government is seeking to identify and maximize economic opportunities arising from the green economy. The green economy has been described in different ways by different organizations. The key point to note is that the green economy is not the same as the environmental sector, although there is overlap. Generally speaking, the green economy is taken to include economic activities such as clean and alternative energy, energy management and efficiency, environmentally friendly manufacturing and construction, cleaner transportation, waste management and recycling activities, environmental protection, and knowledge and support activities such as research and development. In Newfoundland and Labrador, the green economy was estimated to account for 5.1 per cent of economic activity and 3.4 per cent of employment in 2009. As the green economy grows and develops over time, the characteristics of "green" jobs and jobs in more traditional sectors will become increasingly similar. For example, the skills and job requirements for engineers, architects, property managers, construction workers, and information and communication specialists, among many others, are increasingly incorporating green practices such as reducing GHG emissions, saving energy and improving water efficiency.

In addition to actions by the Provincial Government, Newfoundland and Labrador Hydro, in partnership with Newfoundland Power, support commercial energy efficiency through their takeCHARGE program, which provides lighting subsidies through retailers and wholesalers. This is in addition to their program for large industrial users of electricity outlined above.

Action Going Forward - Small and Medium-Sized Enterprises:

The Provincial Government will work with businesses to support efforts that can help improve competitiveness, while contributing to the province's climate change goals. Actions will include:

- Develop a road map for businesses to help them navigate programs that could promote energy efficiency and/or action on climate change.
- Review how current business diagnostic tools support businesses in their efforts to improve energy management and understand the carbon footprints of their products and services.

- Explore the development of incentives to increase action on energy efficiency and climate change in the private sector.
- Pilot a Building Construction Plan Energy Efficiency Advice Service for businesses seeking to improve the energy efficiency of a new building during its planning phase.
- Examine the case for adopting new national energy codes for buildings in Newfoundland and Labrador, in collaboration with key stakeholders including Municipalities Newfoundland and Labrador, the construction industry, and the design consulting and business communities.
- Collaborate with other provinces, territories and the Federal Government on the development of new energy codes, energy-efficient product standards and more informative labelling.
- Consider the findings of the Study on the Green Economy and develop a government action plan on next steps.
- Strengthen the dialogue with business on the economic development opportunities and risks associated with climate change and energy efficiency.

5.5 Fisheries and Aquaculture

The fishing and aquaculture industries are the cornerstones of rural Newfoundland and Labrador and they continue to provide a significant contribution to overall economic activity and employment in the province. Climate change and energy efficiency are issues of increasing concern to this sector. Internationally, marketplaces are increasingly looking for products from sustainable sources and these trends are evolving to also now include "low-carbon footprints". Suppliers will be required to meet those evolving criteria to maintain their markets. At the same time, rising fuel prices have increased the economic benefits of investing in energy efficiency for both harvesters and processors, as they seek to find competitive advantages and relief from fuel costs.

Actions to Date – Fisheries and Aquaculture:
The Provincial Government, often in partnership with other entities including the Fish, Food and Allied Workers, Fisheries and Marine Institute, Memorial University, the Newfoundland and Labrador Research and Development Corporation, federal departments and research centres, and the Canadian Centre for Fisheries Innovation have initiated a variety of measures to help this sector improve their energy efficiency and lower their overall carbon footprint while increasing competitiveness. Several key initiatives include:

- Launched the fishing vessel energy efficiency initiative, and projects have included fishing vessel energy efficiency workshops, fact-sheets on energy efficiency, energy-efficient shrimp trawl designs, and a three-year energy audit program.

Catalina, NL
Image Source: Stacey Cheater

Fishing Vessel Energy Audit Project

The energy audit project, part of government's fishing vessel energy efficiency initiative, is studying the fuel consumption on a variety of different fishing vessels in various operating conditions, including weather and sea states. The project is being supported by a $200,000 contribution from the Provincial Government, and is being conducted in partnership with a number of other entities including the Canadian Centre for Fisheries Innovation, the Fish, Food and Allied Workers Union, Memorial University, the Newfoundland and Labrador Research and Development Corporation, and federal departments and research centres.

- Promoted energy efficiency in the processing sector through workshops, energy audits on processing plants, and a handbook to help engineers and technical staff improve the energy efficiency of their plants.
- Established an expert advisory committee on energy efficiency in the harvesting sector, with representation from industry, academia and government departments.
- Funded a study of marine-based feedstock for the development of low-carbon biofuels. The study, by the Fisheries and Marine Institute, concluded that current levels are too low to support production, but it provided important foundational information on possible options for fish products.
- Worked with industry, Memorial University and the Fisheries and Marine Institute on reducing waste and identifying other commercial opportunities. For example, some past waste products including oils, frames and shells, that were being shipped to landfills and emitting methane, are now being used for commercial products.
- Worked with the Federal Government and industry partners on fishing vessel replacement policies as part of the Fishing Industry Renewal Strategy. These policies support access to larger and more efficient vessels.

Actions Going Forward – Fisheries and Aquaculture:

- Continue to implement the fishing vessel energy efficiency initiative, including the industry-wide promotion of fuel-saving opportunities that are being identified through the energy audit initiative.
- Explore opportunities for partnerships with industry that could promote the adoption of fuel-saving technologies in the fishery and/or reduce overall waste through the identification of new commercial products.
- Continue to support the expert advisory committee on energy efficiency in the harvesting sector.
- Engage the Federal Government on promoting fuel-efficient vessel designs that also maintain superior safety and stability for operators.
- Engage the fish processing sector on the merits of establishing an expert advisory committee on energy efficiency, as has been established for the harvesting sector.

5.6 Forestry, Agriculture and Natural Areas

Much of the discussion on reducing GHG emissions to this point has focused on reducing the use of fossil fuels through energy efficiency or fuel-switching to clean energy. However, in the forestry and agricultural sectors and the province's natural areas, there are additional implications relating to managing GHG emissions from *non-energy* sources.

Trees, soils and environmental features such as wetlands and bogs can store significant volumes of carbon dioxide. When they are disturbed,

whether through commercial activity or natural events such as forest fires, significant volumes of GHG emissions can be released into the atmosphere. For these reasons, increasing attention is being paid to managing non-energy sources to either increase their ability to store carbon dioxide or preserve them to continue to act as "carbon sinks". In Newfoundland and Labrador, forests are estimated to be a net source of emissions, totalling 1 Mt in 2008. The level of emissions is lower than the early 2000s, when net emissions averaged 2 Mt.

Parks and protected areas are also increasingly recognized in their ability to sequester carbon. In Newfoundland and Labrador, there is approximately 5,455 km^2 of protected territory comprising 32 provincial parks, two wilderness reserves, 18 ecological reserves, one public reserve, and one special management area. Research has also shown that the preservation of natural areas is also helpful to climate change adaptation, as they provide ideal locations to study changes over time and can preserve naturally occurring flood protection and watersheds.

Cape St. Mary's Ecological Reserve, NL

Initiatives to Date: Forestry, Agriculture and Natural Areas:

Key actions to date by the Provincial Government include:

- The Forestry and Agrifoods Agency partnered with the Federal Government on carbon accounting models to improve measurement of the net contributions of the forest sector, including carbon stored in wood products. The agency also funded research aimed at understanding carbon changes in soils resulting from climate change, and made research on climate change one of its key priorities in its Forest Research Strategy.
- The Department of Environment and Conservation continues to develop its Natural Areas Systems Plan to complete a comprehensive system of parks and protected areas. An expanded network of protected areas will increase the total land base supporting carbon sequestration and other climate change mitigation and adaptation services. The development of the Conservation Blueprint for Labrador in partnership with Nature Conservancy of Canada will also provide baseline information for conservation planning and completion of the protected areas system in Labrador.

Actions Going Forward: Forestry, Agriculture and Natural Areas:

The Provincial Government recognizes the opportunities to manage non-energy resources in a manner that sequesters additional carbon and maintains existing sinks. The key actions over the next five years will include:

- Work with the Federal Government to improve measurement capabilities in carbon accounting models for the forestry and agriculture sectors in Newfoundland and Labrador.
- Explore the potential for changes in forest management practices to increase the carbon storage potential.

- Work with the agriculture industry to promote techniques that minimize the release of GHG emissions, including livestock, nutrient and land management, while continuing to promote industry growth and diversification.
- Include climate change issues in the consideration of a policy on commercial-scale peat mining.
- Complete the Natural Systems Plan for the province, taking into consideration possible climate change scenarios and effects during this process to inform the placement and design of new protected areas.
- Collaborate with the Federal Government, academic institutions and non-governmental organizations to advance research on carbon management in the province's natural areas.

5.7 Transportation

The transportation sector, excluding off road emissions, is responsible for approximately 31 per cent of the province's GHG emissions. Emissions from road transportation (passenger vehicles and heavy trucks) account for approximately 70 per cent of transportation emissions, with the remaining emissions coming from air, marine and rail transport.

Many provinces have sought to reduce GHG emissions from the transportation sector, but achieving progress has been challenging. Economic growth is often accompanied by an increased demand for transportation services, which can lead to more vehicles on the roads and more planes in the air. There has been significant technological progress in recent decades on low-emission vehicles, such as hybrids and alternative fuels, but mainstream adoption of these technologies will take time. The Federal Government has worked in partnership with the United States to improve the efficiency of passenger and light-duty trucks, and these regulations are expected to reduce natural GHG emissions by 92 Mt by 2016. In addition, the Federal Government recently completed regulations that will require higher amounts of renewable fuels in gasoline. These regulations are expected to lower national GHG emissions by 4 Mt annually.

Hybrid and Electric Vehicles

There is innovation occurring in the global vehicle market that is promising significant energy and GHG savings - the development of hybrid and all-electric vehicles. Hybrid vehicles use two sources of power, a conventional engine and a battery that is re-charged when the vehicle is in motion. Some hybrid models provide a plug-in option that can enable the owner to re-charge the vehicle from an outlet. These vehicles offer GHG savings over traditional vehicles as they do not always need to rely on the combustion of carbon-based fuels. Hybrid vehicles are beginning to share the marketplace with electric vehicles that rely solely on battery power. These vehicles can greatly reduce GHG emissions, but only when the electricity is generated from a clean energy source such as hydroelectricity or wind. The potential GHG benefits are not realized when the electricity is generated from carbon-intensive fuels such as coal, as GHGs are just emitted at the power station rather than on the road.

These are unique challenges in Newfoundland and Labrador with respect to the transportation sector. Newfoundland and Labrador is the most rural province in Canada, with 50 per cent of the population living in rural locations. Its largest centres do not have sufficient population to support mass transit options such as rail and the provincial population is too small to support unique vehicle efficiency standards. In addition, biofuels are not readily available in sufficiently large quantities to power the province's vehicles. As a result, GHG savings in the transportation sector will largely depend on individual decisions concerning means of transportation, vehicle purchases, driving habits and distance traveled, for the foreseeable future.

Initiatives to Date – Transportation:

The Provincial Government has supported a number of initiatives to reduce GHG emissions from road transportation. They include:

- $1.57 million in Green Fund support for the St. John's Cycling Master Plan, which comprises a series of measures to promote cycling and reduce car use in the city. The estimated reduction is 1,900 tonnes of GHGs annually.
- $85,400 in Green Fund support for Metrobus public transit in St. John's to install hybrid devices on six of its buses. The devices provide electric power to various engine components and eliminate the need to rely on the traditional diesel engine. The estimated reduction is 67 tonnes of GHGs annually.
- $28,000 in Green Fund support for an awareness campaign by Metrobus public transit in St. John's. The estimated reduction is 40 tonnes of GHGs annually.

Additional efforts to reduce GHG emissions from transportation have focused on the Provincial Government's own operations and support for fishing vessels, as elaborated previously.

Freight transportation in Labrador
Image Source: Chris P. Sampson

Action Going Forward – Transportation:

The Provincial Government will pursue a number of measures to lower GHG emissions in the transportation sector, including:

- Collaborate with the Federal Government and other provinces and territories on the development and implementation of strengthened efficiency standards for light and heavy-duty vehicles, and better energy efficiency labelling on vehicles for consumers.
- Collaborate with industry to explore opportunities to improve the energy efficiency of heavy trucks.
- Engage the Federal Government to ensure its funding programs for fuel-efficient technology on heavy trucks can support small trucking operations like those often found in Newfoundland and Labrador.
- Review new driver training material and examinations for opportunities to strengthen driver knowledge on fuel-saving opportunities.
- Continue to support the implementation of the federal, provincial and territorial agreement on vehicle weights and dimensions, which sets the underlying framework for the adoption of many fuel-saving practices for heavy trucks.
- Collaborate with partners through the Conference of New England Governors and Eastern Canadian Premiers to continue studying the costs and benefits of a low-carbon fuel standard for the region.
- Examine the state of technology, infrastructure requirements and market developments for electric vehicles.

5.8 Waste

The waste sector is responsible for 7 per cent of GHG emissions in Newfoundland and Labrador. The vast majority of GHG emissions are generated from organic waste in landfills (approximately 30 per cent of all waste), which creates methane when it decays without the presence of oxygen. However, the entire "carbon footprint" of waste can be much larger when including

the GHGs that are generated from the production, transportation and disposal of the waste item.

Reducing waste is a challenge across the globe as higher populations and economic growth are most often accompanied by higher volumes of waste. Effective waste management relies on a number of factors including individual awareness and decision-making, community and provincial infrastructure, effective regulation and the availability of recycling and composting services. Like the broader effort on climate change, waste management is a shared challenge that cannot be addressed by one sector or level of government alone.

Waste management has clear environmental benefits, but it can also present unique economic opportunities. There are global markets for recycled products and compost, new technologies to capture methane and generate electricity, and cost savings to be realized for communities and businesses that reduce their total volume of waste material.

Initiatives to Date – Waste:

In May 2007, the Provincial Government announced the $200 million implementation plan for its Solid Waste Management Strategy, which was originally released in 2002. This comprehensive strategy is intended to establish modern waste management practices in the province by:

- Diverting 50 per cent of the materials currently going to landfills;
- Reducing the number of waste disposal sites by 80 per cent;
- Eliminating open burning and phasing out incinerators; and
- Phasing out unlined landfill sites.

Significant advances in solid waste management are now being made and the majority of the population will be participating in modern waste management systems by 2012. It is expected that full implementation of the strategy will occur by 2020.

The major pillars supporting the implementation of this strategy are: (1) capital funding for new waste management infrastructure and materials recovery facilities; (2) collaboration with regional and sub-regional entities to develop waste management solutions; and (3) enhanced awareness and education to drive waste reduction by businesses and the general public.

The Provincial Government and its municipal partners are moving forward on the implementation of this strategy. Several of the key completed and ongoing initiatives include:

- Completion of the Material Recovery Facility at the Robin Hood Bay Regional Waste Management Facility in St. John's, which provided the eastern region with the opportunity to implement curb-side recycling and divert a large portion of waste from the landfill.
- Implementation of methane capture technology at the Robin Hood Bay Regional Waste Management Facility, with funding provided through the Provincial Government's Green Fund. This project has the potential to reduce GHG emissions up to 60,000 tonnes annually.
- Construction of the full-service waste management facility in Norris Arm North, as well as seven transfer stations, to support modern waste management in the central region.
- Ongoing study to determine the type and location for full-service waste management for the western region on the island of Newfoundland.
- Funding for various communities to purchase new waste collection vehicles to support consolidated waste collection services and recycling.

Image Source: Multi-Materials Stewardship Board

The Multi-Materials Stewardship Board (MMSB) has been a key partner with the Provincial Government in moving forward modern waste management in the province. Its flagship program is the Used Beverage Container Recycling Program. A recent carbon footprint analysis showed that the recycling of these containers has seen a reduction in 8,700 tonnes of GHGs associated with the manufacturing of new containers. This program, as well as other efforts targeted at tires, paper and composting, diverted over 15,000 tonnes of waste from provincial landfills in 2009.

The MMSB has also supported a suite of other initiatives to support modern waste management including the Get to Half public awareness campaign, school and business outreach efforts, and information and advice on household and community composting which can greatly reduce methane generation in the province's landfills. The MMSB also works collaboratively with other provinces and territories on Extended Producer Responsibility, to drive greater action by manufacturers to design products that create less waste and cost less to manage during their end-of-life disposal. The MMSB is currently working with industry to develop Extended Producer Responsibility programs for waste paint, electronic waste, waste pharmaceuticals and medical sharps.

Actions Going Forward – Waste:

The Provincial Government is committed to modern waste management in the province and will continue to identify opportunities for GHG reduction. The Provincial Government will:

- Continue implementation of the Provincial Solid Waste Management Strategy.
- Study opportunities for methane capture in landfill sites, building on success of the project implemented at the Robin Hood Bay Regional Waste Management Facility.
- Promote opportunities for community composting projects, which can reduce material going to landfills.
- Continue education and awareness raising efforts through the MMSB, including through the Get to Half Program and continued school engagement and the establishment of "Green Teams" in the province's business community.
- Collaborate with other jurisdictions through the Canadian Council of Ministers of the Environment to advance Extended Producer Responsibility programs in Canada.

6

LEVERAGING INTERGOVERNMENTAL PARTNERSHIPS

6.0 LEVERAGING INTERGOVERNMENTAL PARTNERSHIPS

The Government of Newfoundland and Labrador has worked actively with the Federal Government and other jurisdictions to advance action on climate change. Through these efforts, government is able to advance the province's interests, leverage the expertise of other jurisdictions, and identify areas where national or regional action is the optimal way forward.

Canadian Premiers have sought to drive forward collaborative action on climate change, in some cases in partnership with U.S. Governors and the Federal Government. The Council of the Federation, Conference of New England Governors and Eastern Canadian Premiers, and various Ministerial forums, including the Council of Energy Ministers, the Canadian Council of Ministers of the Environment, Council of Ministers Responsible for Transportation and Highway Safety, Canadian Council of Forest Ministers and Forum of Ministers Responsible for Local Government, have worked together on initiatives to tackle climate change.

Gros Morne, NL
Image Source: ©Barrett & MacKay Photo, courtesy of the Department of Tourism, Culture and Recreation

Collaboration with the Atlantic provinces has been a particular priority for the Provincial Government on issues ranging from clean energy development, as witnessed by the historic signing of the Muskrat Falls partnership agreement, to other areas including fisheries and aquaculture, transportation and procurement. This work is supported by a variety of bodies including the Council of Atlantic Premiers, Council of Atlantic Environment Ministers, Atlantic Energy Ministers and Atlantic Council of Fisheries and Aquaculture Ministers.

The Federal Government is an important partner in taking action on climate change as it has jurisdiction over a number of key policy areas and has the resources to support nationally focused initiatives. For example, the Federal Government establishes energy-use standards for appliances, sets fuel-efficiency standards for passenger vehicles and heavy trucks, and maintains the largest network of climate monitoring stations in Canada. It also supports targeted initiatives like the Newfoundland and Labrador Green Fund and the Atlantic Climate Adaptation Solutions initiative through its national programs.

One of the goals established by the Provincial Government in this plan is the need to collaborate with other governments to drive forward action on climate change. As the previous pages have illustrated, a number of commitments have been made which support the achievement of that goal. These are summarized in the Strategic Framework in section 8.0.

Moving forward, the Provincial Government will continue to proactively engage other governments to identify opportunities for collaboration on climate change.

Torngat Mountains, NL
Image Source: ©Barrett & MacKay Photo, courtesy of the Department of Tourism, Culture and Recreation

7

MEASURING PROGRESS

7.0 MEASURING PROGRESS

Responding to climate change is a challenging endeavour and, as the preceding pages make clear, it will require the use of a blend of policy instruments ranging from information campaigns and incentives, to regulations and intergovernmental collaboration.

This Climate Change Action Plan is a government-wide plan, but the specific action items are the responsibility of individual departments, offices, and agencies. The goals, objectives and action items outlined in this plan are the current priorities for action, but this plan is designed to be flexible so that it may incorporate additional actions in the future.

As this Climate Change Action Plan is implemented several efforts will be utilized to track and report on progress:

- The Office of Climate Change, Energy Efficiency and Emissions Trading will develop an Accountability Framework to support the internal performance measurement process, in consultation with interested departments. The Accountability Framework will confirm the departments' roles and responsibilities under this Climate Change Action Plan, establish annual performance measures and targets, determine the performance monitoring and reporting requirements, and assess the need for and timing of any program evaluations.
- The Premier will table a written statement each year in the House of Assembly outlining progress to date.
- A report will be published halfway through the five-year plan and again at the end outlining progress on the commitments in this plan.
- Established processes, such as the regular monitoring and periodic evaluation of programs, will be utilized to document the impact of departmental initiatives.

Witless Bay, NL

Cape Spear, NL

8

STRATEGIC FRAMEWORK

Climate Change Action Plan

8.0 STRATEGIC FRAMEWORK - CLIMATE CHANGE ACTION PLAN

Vision	*A province that effectively integrates progressive action on climate change into its policy, planning and programs in a way that supports future economic, social and environmental success.*
Guiding Principles	• *Promote province and economy-wide action,* recognizing the need for all sectors of the economy to play their part in tackling climate change. • *Identify and maximize opportunities,* such as the development of the province's clean energy resources, improving competitiveness, promoting energy efficiency and developing new technologies. • *Understand and minimize risk,* particularly those associated with the potential impacts of climate change including stronger storm surges, sea-level rise and reduced winter sea ice. • *Utilize a blend of policy instruments,* recognizing that effective action on climate change requires the use of multiple approaches ranging from information campaigns to regulation. • *Support collaboration and partnerships,* to utilize the experience and expertise that is readily available in the public, private, academic and non-governmental sectors in Newfoundland and Labrador.
Goal 1	**Enhance Newfoundland and Labrador's resilience to the impacts of climate change**
Objective 1.1	Strengthen the understanding of the impacts of climate change on the province.
Action Items	• Collaborate with other governments and the research and academic community with a view to strengthening long-term climate forecasting for the province. • Consider the findings of the study on climate change monitoring capabilities in the province and next steps. • Collaborate with the Federal Government to strengthen climate monitoring networks and information on local precipitation trends to support infrastructure design. • Continue to strengthen the Newfoundland and Labrador Water Resources Portal and work to identify additional sources of information that can be digitized and made publicly available through this Geographic Information System. • Continue to implement the Forest Research Strategy which has a strategic focus on better understanding the impacts of climate change on forests in the province.

	• Work with the academic and research community to develop research priorities and enhance the dialogue on the impacts of climate change in Newfoundland and Labrador. Northern Labrador • Identify research needs on climate change in northern Labrador and work with other partners to consider the best way to address them. • Identify ways to better engage northern Labrador communities on issues pertaining to climate change adaptation.
Objective 1.2	Improve the integration of climate change adaptation into decision-making.
Action Items	• Continue to implement the ACAS project and partner with Municipalities Newfoundland and Labrador and Professional Municipal Administrators to roll out the findings to all communities. • With a $600,000 annual investment over three years through Budget 2011, establish new flood risk maps for at-risk locations and, where it is possible to predict flooding, alert systems to notify government, communities and emergency response personnel of potential flooding. The new maps will incorporate climate change predictions to enhance their ability to support informed decisions and community planning. • With a $100,000 annual investment over three years through Budget 2011, establish a new Coastal Erosion Monitoring and Mapping Program and make the data and reports available through the Newfoundland and Labrador Water Resources Portal and other publications. • Continue to include consideration of climate change implications (e.g. potential for flooding) in the site selection and design of Provincial Government buildings and infrastructure and extend these considerations to those receiving public funding. • Continue to implement and enforce the Land Use Policy for Flood Risk Areas. • Analyze opportunities to incorporate climate change considerations into community planning efforts, with a view to identifying opportunities for synergies across planning processes and minimizing administrative burden. • Continue to support communities in their preparation of Emergency Management Plans, which are due by May 2012. Northern Labrador • Promote best practices in community development in the north through appropriate planning and building practices to support long-term sustainability.

	• Identify ways in which decision-making tools on climate change in northern Labrador could be improved, such as climate observation networks, flood risk mapping and information on local ice conditions. • Share expertise and information with a view to supporting the shared future directions and plans of the Nunatsiavut Government, Innu Nation and Provincial Government.
Goal 2	**Reduce greenhouse gas emission levels in Newfoundland and Labrador**
Objective 2.1	Pursue the greenhouse gas (GHG) reduction targets of the Conference of New England Governors and Eastern Canadian Premiers on a provincial basis: 10 per cent below 1990 levels by 2020 and 75-85 per cent below 2001 levels by 2050.
Action Items	**Provincial Government** The actions to be taken by the Provincial Government that will contribute to this objective are outlined under Goal 3. **Households** • Renew the Residential Energy Efficiency Program with an investment of $12 million over three years through Budget 2011. • Continue to support the implementation of the EnerGuide for Homes Program. • Work with other provinces and territories to encourage the Federal Government to develop long-term federal funding arrangements for residential energy efficiency retrofits. • Launch Phase Two of the Coastal Labrador Energy Efficiency Pilot Program in two new Labrador communities and evolve the delivery model to increase the uptake of available energy efficiency programs in these communities and those visited in Phase One. • Pilot a Building Construction Plan Energy Efficiency Advice Service for housing contractors and homeowners seeking to improve the energy efficiency of their building designs during the planning stage. • Collaborate with other provinces, territories and the Federal Government on the development of new energy codes, energy-efficient product standards and more informative labelling. • Work with municipalities to ensure that they are aware that the new Model National Energy Code for Houses will be incorporated into the National Building Code in 2012 and assist them to prepare for this change.

Large Industry

- Pursue the development of the Muskrat Falls hydroelectric project and, through an interconnect with the island of Newfoundland, eliminate 1.2 Mt of GHG emissions from the Holyrood Generating Station.
- Develop, and publicly release in 2012, a detailed approach for the energy-intensive sector on climate change. This approach will include a GHG reduction target for the sector. The development of policies will be guided by 11 core principles:
  - Contribute to provincial GHG reduction targets
  - Encourage economic development
  - Take account of trade-exposed nature of energy-intensive sector
  - Provide greater long-term certainty for industry
  - Prepare the energy-intensive sector for a carbon-constrained future
  - Support Lower Churchill Hydroelectric project
  - Accommodate the unique circumstances of the offshore oil and mining sectors
  - Acceptable fiscal impacts on government
  - Encourage new investment in the province
  - Stimulate green technology development and deployment and job growth
  - Pursue administrative efficiency and low transaction costs

- The Provincial Government will pursue three early actions to move forward with this sector as it develops its broader policy approach. These are:
  - Become a formal observer to the Western Climate Initiative
  - Apply Best Available Control Technology requirements in the Air Pollution Control Regulations to greenhouse gas emissions for new investments in the large-industrial sector
  - Seek to influence federal policy as the Federal Government considers future policies and regulations to reduce GHG emissions.

Small and Medium-Sized Enterprises

- Develop a road map for businesses to help them navigate programs that could promote energy efficiency and/or action on climate change.
- Review how current business diagnostic tools support businesses in their efforts to improve energy management and understand the carbon footprints of their products and services.

- Explore the development of incentives to increase action on energy efficiency and climate change in the private sector.
- Pilot a Building Construction Plan Energy Efficiency Advice Service for businesses seeking to improve the energy efficiency of a new building during its planning phase.
- Examine the case for adopting new national energy codes for buildings in Newfoundland and Labrador, in collaboration with key stakeholders including Municipalities Newfoundland and Labrador, the construction industry, and the design consulting and business communities.
- Collaborate with other provinces, territories and the Federal Government on the development of new energy codes, energy-efficient product standards and more informative labelling.
- Consider the findings of the Study on the Green Economy and develop a government action plan on next steps.
- Strengthen the dialogue with business on the economic development opportunities and risks associated with climate change and energy efficiency.

Fisheries and Aquaculture

- Continue to implement the fishing vessel energy efficiency initiative, including the industry-wide promotion of fuel-saving opportunities that are being identified through the energy audit initiative.
- Explore opportunities for partnerships with industry that could promote the adoption of fuel-saving technologies in the fishery and/or reduce overall waste through the identification of new commercial products.
- Continue to support the expert advisory committee on energy efficiency in the harvesting sector.
- Engage the Federal Government on promoting fuel-efficient vessel designs that also maintain superior safety and stability for operators.
- Engage the fish processing sector on the merits of establishing an expert advisory committee on energy efficiency, as has been established for the harvesting sector.

Forestry, Agriculture and Natural Areas

- Work with the Federal Government to improve measurement capabilities in carbon accounting models for the forestry and agriculture sectors in Newfoundland and Labrador.
- Explore the potential for changes in forest management practices to increase the carbon storage potential.

- Work with the agriculture industry to promote techniques that minimize the release of GHG emissions, including livestock, nutrient and land management, while continuing to promote industry growth and diversification.
- Include climate change issues in the consideration of a policy on commercial-scale peat mining.
- Complete the Natural Systems Plan for the province, taking into consideration possible climate change scenarios and effects during this process to inform the placement and design of new protected areas.
- Collaborate with the Federal Government, academic institutions and non-governmental organizations to advance research on carbon management in the province's natural areas.

Transportation

- Collaborate with the Federal Government and other provinces and territories on the development and implementation of strengthened efficiency standards for light and heavy-duty vehicles, and better energy efficiency labelling on vehicles for consumers.
- Collaborate with industry to explore opportunities to improve the energy efficiency of heavy trucks.
- Engage the Federal Government to ensure its funding programs for fuel-efficient technology on heavy trucks can support small trucking operations like those often found in Newfoundland and Labrador.
- Review new driver training material and examinations for opportunities to strengthen driver knowledge on fuel-saving opportunities.
- Continue to support the implementation of the federal, provincial and territorial agreement on vehicle weights and dimensions, which sets the underlying framework for the adoption of many fuel-saving practices for heavy trucks.
- Collaborate with partners through the Conference of New England Governors and Eastern Canadian Premiers to continue studying the costs and benefits of a low carbon fuel standard for the region.
- Examine the state of technology, infrastructure requirements and market developments for electric vehicles.

Waste

- Continue implementation of the Provincial Solid Waste Management Strategy.
- Study opportunities for methane capture in landfill sites, building on success of the project implemented at the Robin Hood Bay Regional Waste Management Facility.

	• Promote opportunities for community composting projects, which can reduce material going to landfills. • Continue education and awareness-raising efforts through the MMSB, including through the Get to Half Program and continued school engagement and the establishment of "Green Teams" in the province's business community. • Collaborate with other jurisdictions through the Canadian Council of Ministers of the Environment to advance Extended Producer Responsibility programs in Canada.
Goal 3	**Demonstrate Provincial Government leadership on climate change**
Objective 3.1	Promote economy-wide action on climate change through policies and measures designed to facilitate widespread engagement and action; and manage government's own operations in a manner consistent with this plan.
Action Items	**Framework for Action** • Develop a public awareness campaign on climate change and energy efficiency with initial funding of $250,000 from Budget 2011. This campaign will promote better understanding of climate change and energy efficiency, including the actions that people in all sectors of the economy can take. • Develop an action plan setting out the practical steps government plans to take to green government going forward. • Explore the potential to utilize the government's procurement power to promote greater energy efficiency, lower GHG emissions and reduce waste. • Explore the best way to ensure that individuals and businesses have access to the right information and tools to move forward on energy efficiency. • Develop an action plan outlining government's role in transforming markets for more energy-efficient and low GHG-emitting goods and services. • Continue to implement the Green Fund in 2011-12 and conduct an evaluation of its impact and effectiveness. • Examine ways to enhance the delivery of energy efficiency programs across government. **Buildings** • Continue to implement the Build Better Buildings Policy. • Conduct energy audits on government buildings in 2011-12, and complete energy audits on all remaining buildings over 1,000 m^2 that have not previously been audited within the next five years. • Develop retrofit plans for cost-effective energy efficiency upgrades that were identified in the energy audits.

	• Roll out the BOMA BESt building management certification process to other government office buildings, following the successful application to the Natural Resources Building. • Explore the potential for green leasing requirements for space that the Provincial Government leases from other building owners. • Continue to implement the Save It Forward program in the province's schools. **Transportation** • Establish a target that 35 per cent of all new car and SUV purchases be energy-efficient or hybrid vehicles for departments, agencies, boards and commissions. This builds on the 25 per cent target from the Energy Plan.
Goal 4	**Advance action on climate change through collaboration with other governments**
Objective 4.1	Proactively engage other governments to identify opportunities for collaboration on climate change.
Action Items	The following commitments have been highlighted previously in their respective section, but are repeated here to bring focus to the need to work with other levels of government on climate change. **Households** • Collaborate with other provinces, territories and the Federal Government on the development of new energy codes, energy-efficient product standards and more informative labelling. • Work with municipalities to ensure that they are aware that the new Model National Energy Code for Houses will be incorporated into the National Building Code in 2012 and assist them to prepare for this change. • Work with other provinces and territories to encourage the Federal Government to develop long-term federal funding arrangements for residential energy efficiency retrofits. **Large Industry** • Pursue the development of the Muskrat Falls hydroelectric project and, through an interconnect with the island of Newfoundland, eliminate 1.2 Mt of GHG emissions from the Holyrood Generating Station. • Work with the Federal Government to ensure that they have information on the unique circumstances of facilities and industries in Newfoundland and Labrador as they consider future policies and regulations to reduce GHG emissions

Small and Medium-Sized Enterprises

- Examine the case for adopting new national energy codes for buildings in Newfoundland and Labrador, in collaboration with key stakeholders including Municipalities Newfoundland and Labrador, the construction industry, and the design consulting and business communities.
- Collaborate with other provinces, territories and the Federal Government on the development of new energy codes, energy-efficient product standards and more informative labelling.

Fisheries and Aquaculture

- Engage the Federal Government on promoting fuel-efficient vessel designs that also maintain superior safety and stability for operators.

Forestry, Agriculture and Natural Areas

- Work with the Federal Government to improve measurement capabilities in carbon accounting models for the forestry and agriculture sectors in Newfoundland and Labrador.
- Collaborate with the Federal Government, academic institutions and non-governmental organizations to advance research on carbon management in the province's natural areas.

Transportation

- Collaborate with the Federal Government and other provinces and territories on the development and implementation of strengthened efficiency standards for light and heavy-duty vehicles, and better energy efficiency labelling on vehicles for consumers.
- Engage the Federal Government to ensure its funding programs for fuel-efficient technology on heavy trucks can support small trucking operations like those often found in Newfoundland and Labrador.
- Continue to support the implementation of the federal, provincial and territorial agreement on vehicle weights and dimensions, which sets the underlying framework for the adoption of many fuel-saving practices for heavy trucks.
- Collaborate with partners through the Conference of New England Governors and Eastern Canadian Premiers to continue studying the costs and benefits of a low carbon fuel standard for the region.

Waste

- Collaborate with other jurisdictions through the Canadian Council of Ministers of the Environment to advance Extended Producer Responsibility programs in Canada.

Climate Change Adaptation

- Collaborate with other governments and the research and academic community with a view to strengthening long-term climate forecasting for the province.
- Consider the findings of the study on climate change monitoring capabilities in the province and next steps.
- Collaborate with the Federal Government to strengthen climate monitoring networks and information on local precipitation trends to support infrastructure design.
- Analyze opportunities to incorporate climate change considerations into community planning efforts, with a view to identifying opportunities for synergies across planning processes and minimizing administrative burden.

Climate Change Adaptation in Northern Labrador

- Identify ways to better engage northern Labrador communities on issues pertaining to climate change adaptation.
- Promote best practices in community development in the north through appropriate planning and building practices to support long-term sustainability.
- Identify ways in which decision-making tools on climate change in northern Labrador could be improved, such as climate observation networks, flood risk mapping and information on local ice conditions.
- Identify research needs on climate change in northern Labrador and work with other partners to consider the best way to address them.
- Share expertise and information with a view to supporting the shared future directions and plans of the Nunatsiavut Government, Innu Nation and provincial government.

ANNEX 1: Acronyms and Glossary

Acronyms

ACAS	Atlantic Climate Adaptation Solutions Initiative
BOMA BESt	Building Owners and Managers Association Building Environment Standards
CAP	Council of Atlantic Premiers
COF	Council of the Federation
EPA	Environmental Protection Agency (U.S.)
GHG	Greenhouse Gas
GDP	Gross Domestic Product
ICLEI	International Council for Location Environmental Initiatives
IOC	Iron Ore Company of Canada
IDF	Intensity-Duration-Frequency
IPCC	Intergovernmental Panel on Climate Change
LEED	Leadership in Energy and Environmental Design
MMSB	Multi-Materials Stewardship Board
Mt	Million tonnes
NEG-ECP	Conference of New England Governors and Eastern Canadian Premiers
PIEVC	Public Infrastructure Engineering Vulnerability Committee
R&D	Research and development
SMEs	Small and Medium-Sized Enterprises
TWh	Terrawatt hours
UNFCCC	United Nations Framework Convention on Climate Change
WCI	Western Climate Initiative

Terms

Adaptation – Actions to plan for and respond to the impacts of climate change, including measures taken by governments, communities and businesses to, among other things, monitor natural resources, protect species and ecosystems, build community capacity and upgrade infrastructure.

Cap and Trade – See Emissions Trading.

Carbon Footprint – The amount of greenhouse gas emissions generated by an organization, product, event or person, including direct emissions such as burning fossil fuels, indirect emissions such as electricity consumption, and embedded emissions such as emissions generated through the production of a good or service.

Carbon Sinks – An area of land or water that can absorb and store carbon dioxide from the atmosphere. Forests are the most common form of carbon sink, as well as soils, peat, permafrost, ocean water and carbonate deposits in the deep ocean. With changes in conditions (e.g. temperature, precipitation, and natural or man-made disturbances), a carbon sink can become a carbon source, in other words it can release carbon dioxide into the atmosphere.

For example, a growing forest is a carbon sink as it absorbs more carbon than it releases, but if the forest burns down or is destroyed by pests, it becomes a carbon source as it releases the stored carbon into the atmosphere.

Carbon Taxes – Taxes which are placed on fuels that emit greenhouse gases when consumed. Within Canada, British Columbia (at the retail level) and Quebec (at the fuel distributor level) have levied carbon taxes on fuels such as gasoline and diesel. Carbon taxes provide an incentive to consumers to improve their energy efficiency or switch to alternative fuel types. They can be levied in a way that makes them revenue neutral – i.e. other taxes are reduced to compensate for the carbon tax.

Conference of New England Governors and Eastern Canadian Premiers – This is a forum of Premiers from Newfoundland and Labrador, Quebec, Nova Scotia, New Brunswick and Prince Edward Island, and Governors from Massachusetts, Maine, New Hampshire, Rhode Island, Vermont and Connecticut. Premiers and Governors meet annually address various cross-border issues including energy and transmission, climate change and air quality, trade and export development and border security.

Council of Atlantic Premiers – This is a forum of Premiers from Newfoundland and Labrador, Nova Scotia, New Brunswick and Prince Edward Island. Premiers meet regularly and discuss issues of mutual concern, including energy development, transportation and infrastructure, health and wellness and the environment. Premiers have also undertaken several trade and export development missions within North America.

Council of the Federation – This is a forum of all Canadian Premiers and Territorial Leaders. It meets annually to address key issues in Canada including the economy, energy, transportation, international and intra-provincial trade, health and emergency preparedness and climate change.

Emissions Trading – Commonly referred to as "cap-and-trade", this is a regulatory regime that sets limits on certain industries' or facilities' annual greenhouse gas emissions, and requires firms to obtain tradable credits to cover their emission levels. Given that climate change is a global problem and the environmental effect of reducing emissions is the same wherever the reductions take place, it makes sense to reduce emissions where the cost is lowest. Emissions trading allows regulated entities greater flexibility than standard regulation as it allows them to choose between reducing their own emissions at the facility or buying allowances from another entity that has reduced its emissions below its target and therefore has surplus credits to sell. All other things being equal, the regulated entity will buy credits if this is cheaper than investing in on-site reductions. Trading systems often permit the use of "offset credits", which are credits generated by GHG-reducing projects in sectors that are not subject to the emissions trading regulation, such as forestation.

Energy Conservation – Refers to measures that seek to alter the behaviour of individuals by encouraging them to reduce energy consumption, including switching off lights when leaving a room, turning off televisions or computers when not in use, or lowering thermostat settings at night.

Energy Efficiency – Refers to using less energy to provide the same level of energy service. In residential homes, increasing insulation or buying high-efficiency appliances can allow householders to reduce their energy consumption and thereby save money while maintaining the same level of comfort. In the industrial sector, new technology investments and processes may save energy while maintaining or increasing the level of production.

Energy-Intensive Sector – Industrial firms and power generators that require large amounts of energy to produce and transport their products and services. In Newfoundland and Labrador, this includes the operations of large industrial firms such as North Atlantic Refinery Limited, Corner Brook Pulp and Paper, Wabush Mines, Iron Ore Company of Canada, Vale Inco, ExxonMobil, Husky Energy, Suncor and Nalcor.

Fuel-switching – The substitution of one type of fuel for another. For example, the substitution of carbon-intensive fuels, such as diesel, with lower GHG-emitting fuels, such as hydroelectricity.

Greenhouse Effect – The process whereby some of the heat reflected by the Earth's surface is trapped by naturally occurring greenhouse gases in the atmosphere keeping the Earth's temperature hospitable.

Greenhouse Gases – Gases that are responsible for climate change and which may be released by natural processes or human activity. The six gases covered by the Kyoto Protocol are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6). The majority of GHGs come from the combustion of fossil fuels, but 'non-energy' sources of GHGs such as those emitted from waste (methane from decaying material), agriculture (nitrous oxide from fertilizers or methane from cattle) and deforestation (carbon dioxide from trees) can account for large amounts of GHGs in some locations.

Green Leasing – A lease between a landlord and tenant that incorporates environmental sustainability principles and practices in the management and occupation of a building or facility. From the landlord's perspective, a green lease provides the advantages of reducing the building's environmental footprint, generating cost savings and enhancing social and environmental reputation. From the tenant's perspective, a green lease results in cost savings and enhanced social and economic reputation.

Intergovernmental Panel on Climate Change – Established in 1988 by the World Meteorological Organization and the United Nations Environment Programme, the IPCC surveys peer reviewed scientific and technical literature and periodically publishes assessment reports on the latest scientific evidence. These reports are approved by 192 governments party to the United Nations Framework Convention on Climate Change and widely recognized as the most authoritative source of information on climate change.

Kyoto Protocol – An international treaty that sets legally binding targets for the reduction of GHG emissions by industrialized countries in the period 2008-2012. Canada ratified the Protocol on December 17, 2002, committing to reduce its GHG emissions by six per cent below 1990 levels by 2012. The Protocol entered into force internationally on February 16, 2005. Australia ratified Kyoto in December 2007, leaving the United States as the only major industrialized nation that has not ratified the agreement. There are currently 193 parties that have ratified the Protcol.

Mitigation – Actions taken by individuals and businesses to reduce their GHG emissions in order to minimize their effects on global climate change. Such actions may be taken in conjunction with national and international policies that seek to reduce GHG emissions.

Offset credits – See Emissions Trading.

Renewable Energy – Sources of energy which are inherently self–renewing, such as hydro, solar, wind, tidal and geothermal energy.

United Nations Framework Convention on Climate Change – An international treaty signed at the 1992 Earth Summit in Rio de Janeiro that established the "ultimate objective" for action to tackle climate change, namely, to stabilize "…greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic [human-induced] interference with the climate system." The Convention included a non-binding commitment for all developed countries to return their emissions to 1990 levels by the year 2000. Canada ratified the Convention on December 4, 1992 and the Convention came into force in March 1994. There are currently 195 parties that have ratified the Convention, including the U.S..

ANNEX 2: GREENHOUSE GAS EMISSIONS IN CANADA

Jurisdiction	Emissions (Mt)			Per capita emissions		Emissions Intensity (Emissions/$B real GDP/Mt)		2020 Provincial-Territorial "Equivalent" Targets (Mt)	
	1990[1]	2009	% Change	1990[1]	2009	1990[1]	2009	10 % below 1990 (NEG-ECP)[2]	17 % below 2005 (Federal)[3]
Canada (total)	590.0	690.0	16.9%	21.3	20.5	0.71	0.54		606.7
Newfoundland & Labrador	9.2	9.5	2.7%	16.0	18.6	0.79	0.52	8.3	8.3
Prince Edward Island	2.0	1.9	-3.6%	15.0	13.4	0.73	0.45	1.8	1.9
Nova Scotia	19.0	21.0	10.5%	20.9	22.4	0.92	0.73	17.1	18.5
New Brunswick	16.0	18.4	15.0%	21.6	24.6	1.01	0.79	14.4	18.1
Quebec	83.2	81.7	-1.8%	11.9	10.4	0.45	0.31	74.9	71.3
Ontario	177.0	165.0	-6.8%	17.2	12.6	0.53	0.32		167.7
Manitoba	18.5	20.3	9.7%	16.7	16.6	0.62	0.48		17.3
Saskatchewan	43.3	73.1	68.8%	43.0	71.0	1.56	1.84		59.2
Alberta	171.0	234.0	36.8%	67.1	63.7	1.73	1.31		191.7
British Columbia	49.8	63.8	28.1%	15.1	14.3	0.49	0.39		52.0
Territories (combined)	2.1	1.9	-9.4%	23.8	17.1	0.58	0.32		1.8

Source: Calculated from Statistics Canada and Environment Canada.

Notes:

1. 1990 is used as the base year in the table as it is the base year for the Kyoto Protocol.
2. The NEG-ECP target is a regional target and applies to the New England States, the Atlantic provinces and Quebec as a region. The figures shown represent what the "equivalent" emissions would be if applied on a provincial-territorial basis. Numbers do not add due to rounding.
3. The federal target is a national level target as set out in the Copenhagen Accord. It is contingent on the target to be established by the United States. The figures shown represent what the "equivalent" emissions would be if applied on a provincial-territorial basis. Numbers do not add due to rounding.

ANNEX 3: GREENHOUSE GAS REDUCTION TARGETS IN CANADA

Jurisdiction	Short-Term	Medium Term	Long Term
Canada (Federal Government)	–	17% below 2005 by 2020	–
Newfoundland and Labrador	1990 levels by 2010	10% below 1990 by 2020	75 - 85% below 2001 by 2050
Nova Scotia	Halfway to 2020 target by 2015	10% below 1990 by 2020	Up to 80% below 2009 levels by 2050
Prince Edward Island	1990 levels by 2010	10% below 1990 by 2020	75 - 85% below 2001 by 2050
New Brunswick	1990 levels by 2012	10% below 1990 by 2020	75 - 85% below 2001 by 2050
Quebec	6% below 1990 by 2012	20% below 1990 by 2020	75-85% below 2001 by 2050
Ontario	6% below 1990 by 2014	15% below 1990 by 2020	80% below 1990 by 2050
Manitoba	6% below 1990 by 2012	-	-
Saskatchewan	-	20% below 2006 by 2020	-
Alberta	20Mt below business as usual (BAU) by 2010	50Mt below BAU by 2020	200Mt below BAU by 2050 Equates to 14% below 2005 levels by 2050
British Columbia	6% below 2007 levels by 2012 18% below 2007 by 2016	33% below 2007 levels by 2020	80% below 2007 by 2050
Yukon	Stabilize by 2010 (Government emissions only)	15% below 2010 by 2015 (Government emissions only)	-
Northwest Territories	10% below 2001 by 2011 (Government emissions only)	-	-
Nunavut	-	-	-

Source: Federal, provincial and territorial climate change information

This page is blank in original document.

Newfoundland Labrador

Printed on Recycled Paper

The Office of Climate Change, Energy Efficiency and Emissions Trading
5th Floor, West Block, Confederation Building
P.O. Box 8700, St. John's, NL A1B 4J6
Tel: (709) 729-1210
Fax: (709) 729-1119
climatechange@gov.nl.ca
http://www.exec.gov.nl.ca/exec/cceeet/index.html

YUKON GOVERNMENT CLIMATE CHANGE ACTION PLAN

FEBRUARY 2009

TAKING ACTION ON CLIMATE CHANGE

Yukon Government

1388

" For many Canadians, the North is part of the imagined body. It's an extension of the self, not the rational self but the self that feels. When the North is damaged and we hear about it, we hurt. The twenty-first century will tell us — once and for all, I suspect — how much of ourselves we're prepared to destroy. "

— Margaret Atwood

ISBN 1-55362-401-7

Published February 2009

Cette publication est disponible en français aussi.

All photos Yukon government except:
sweet clover image pages 18/19 – Lloyd Freese

Printed on Rolland Enviro 100
(100% post-consumer recycled content)

Copies available from:
Environment Yukon
Environmental Programs Branch, V-8
Box 2703, Whitehorse, Yukon Y1A 2C6
Email: climatechange@gov.yk.ca
www.environmentyukon.gov.yk.ca

TABLE OF CONTENTS

CLIMATE CHANGE ACTION PLAN

Message from the Yukon Government 5
Highlights 6
Introduction 8
Summary of Actions 12
Actions in Detail 15
Goal 1: Enhance our knowledge and Understanding of Climate Change 15
Goal 2: Adapt to Climate Change 17
Goal 3: Reduce our Greenhouse Gas Emissions 23
Goal 4: Lead Yukon Action in Response to Climate Change 29
Next Steps 32

APPENDICES

Climate Change and Greenhouse Gases 34
Yukon Government Departments and their Roles 37
Yukon Government Partners 39
Glossary 41
Resources 43
50 Ways to Reduce Your Emissions 44

Extensive flooding took place in the Southern Lakes region during the summer of 2007. Very high snow packs and the weather were factors.

MESSAGE FROM THE YUKON GOVERNMENT

The Climate Change Action Plan sets out how the Yukon government is responding to climate change. It shows us actions now underway as well as what new or enhanced actions would help advance our priorities. It identifies priority actions which are to be undertaken now and actions which should be undertaken in the future.

This action plan is the result of input received from more than 100 individuals and organizations through written submissions, workshops and meetings. The plan, providing clear direction and action, advances the goals of the Climate Change Strategy.

Implementation of the Action Plan will involve all departments and agencies of the Yukon government. We will also work with partners to meet the challenges and opportunities of climate change in Yukon – other governments, non-government organizations, industry, and the academic community.

Climate change is a global challenge where all jurisdictions, including Yukon, have an important role to play. Our response to climate change will build on our territory's strengths as well as acknowledge our inherent challenges.

The Climate Change Action Plan will help us coordinate and improve our efforts to adapt to, understand, and lessen our contributions to climate change. Living in a healthy environment is something we all wish to enjoy as well as pass on to our children and future generations.

Dennis Fentie
Premier

Elaine Taylor
Minister of Environment

HIGHLIGHTS

It is the belief of the Yukon government that climate change is happening, that human behaviour is a major contributor, and that a coordinated response is needed.

The Climate Change Action Plan recognizes that the Yukon government must concentrate on the challenges and opportunities that are most relevant to our rural and northern setting. Realizing the magnitude of work to be undertaken, not all actions or goals can be achieved immediately.

A key priority of the Action Plan is to enable effective adaptation to climate change. No matter how much people reduce their greenhouse gas emissions, climate change will continue for many years. That is the simple reality. We therefore need to adapt.

Recognizing the Yukon government cannot address climate change alone, priority will be given to forging partnerships with other governments, organizations and individuals to facilitate a comprehensive and coordinated approach to addressing climate change in the territory.

Work by the Yukon government and others in response to climate change will also provide economic, social and other environmental benefits. It is essential that we all prepare for the impacts of a warming climate. Climate change is real, and it threatens our forests, our watersheds, and our way of life.

did you know?

The Yukon government already has undertaken many actions that respond to climate change, including:

- developing the Yukon Cold Climate Innovation Centre,
- supporting the Northern Climate ExChange for public education and outreach,
- funding community recycling depots and other groups that reduce waste generation, promote public awareness and divert solid waste, and
- working with provincial and territorial counterparts to enhance national building standards.

Southern Kluane Lake near the Slims River.

YUKON GOVERNMENT'S CLIMATE CHANGE ACTIONS

Goal 1 – Enhance Knowledge and Understanding of Climate Change

- Establish a Yukon Research Centre of Excellence
- Establish climate change research study areas
- Develop climate scenarios

Goal 2 – Adapt to Climate Change

- Complete a Yukon infrastructure risk and vulnerability assessment and determine adaptation strategies in response
- Develop an inventory of permafrost information for use in decision making
- Complete a Yukon water resources risk and vulnerability assessment
- Create a tool to facilitate the collection and distribution of water quantity and quality data
- Conduct a Yukon forest health risk assessment
- Conduct treatments to reduce forest fuel loads and protect communities
- Conduct a Yukon forest tree species and vulnerability assessment

Goal 3 – Reduce our Greenhouse Gas (GHG) Emissions

- Yukon government's internal operations: cap GHG emission in 2010, reduce GHG emission by 20% by 2015 and become carbon neutral by 2020
- Report on Yukon government operations through 'The Climate Registry'
- Develop a carbon offset policy for internal operations
- Incorporate environmental performance considerations in the government's procurement decisions
- Government-funded new residential construction will meet GreenHome energy efficiency standards
- Government-funded commercial and institutional, construction and renovation will meet or exceed the LEED Certified Standard for energy efficiency
- Improve energy efficiency and reduce the greenhouse gas emissions of the government's light vehicle fleet
- Implement an Environmental Stewardship Initiative for the Department of Education and Yukon schools
- Establish 'green action committees' in all departments
- Conduct an energy analysis of all Yukon government buildings and complete energy saving retrofits
- Develop best management practices for industry to reduce GHG emissions
- Undertake an extensive study of the transportation sector and recommend options to reduce emissions
- Develop incentives for fuel efficient transportation
- Develop pilot projects to demonstrate home and commercial energy efficiency and heating technology
- Improve access to home energy evaluations by providing evaluator training
- Develop wood energy opportunities for residential and institutional heating

Goal 4 – Lead Yukon Action in Response to Climate Change

- Forecast potential future GHG emissions for Yukon
- Work with federal partners to ensure national GHG Inventory is accurate and consistent for Yukon
- Set a Yukon-wide emissions target within two years
- Create a Climate Change Secretariat
- Determine the potential of a Yukon carbon economy
- Incorporate climate change considerations into government decision making
- Create a community engagement forum for taking action on climate change

INTRODUCTION

The Climate Change Action Plan sets out in detail the actions the Yukon government will undertake to address climate change, within its areas of responsibility. It builds upon the **goals** set out in our Climate Change Strategy, which are to:

- enhance our knowledge and understanding of climate change,
- improve our ability to adapt to climate change,
- reduce our greenhouse gas emissions, and
- lead Yukon action in response to climate change.

The government wants Yukon to become a region able to minimize the negative impacts of climate change, committed to mitigation, and willing to recognize and act on new opportunities presented by climate change.

As a small jurisdiction with limited resources, Yukon must focus on priority actions that provide the most benefit to the territory. The following **principles** guided the development of the Climate Change Action Plan:

- *Focus on relevant issues* — Concentrate on the challenges and opportunities that are most relevant to Yukon and our rural and northern setting.
- *Use an informed approach* — Base our actions on science, traditional knowledge and analysis. Where uncertainties exist, these will be identified but not used as a barrier to prevent action.
- *Take logical steps* — Not all actions or goals can be achieved immediately. For many actions, additional information, research, regulations, policies or infrastructure may be required. In those cases, ensure each step works logically and effectively towards achieving the final objective.
- *Build on existing strengths* — Yukoners have proven experience in public education, outreach, monitoring, research, building sciences and energy solutions programs. Build on and expand these strengths and expertise.

A broad representation of Yukoners were involved with the development of the Action Plan.

definitions

Mitigation – Measures that seek to avoid, reduce or delay global warming by reducing GHG emissions. For example, switching to renewable energy sources such as hydro is one way to mitigate climate change.

Intergovernmental Panel on Climate Change (IPCC) – The scientific body established to collect and synthesize the world's best research on climate change. Their work on the Fourth Assessment Report (AR4) recently won the Nobel Prize. All reports, including the *Summary for Policymakers*, can be found online: **www.ipcc.ch**.

DEVELOPING THE ACTION PLAN

The Yukon government released its Climate Change Strategy in 2006. Environment Yukon then began researching and collecting information needed to develop this Action Plan. Preparation included discussions with a wide variety of government and non-government representatives, an interdepartmental workshop, working-group meetings and several external workshops.

The Scoping the Yukon Government Climate Change Action Plan Workshop invited people from all over Yukon to share their views on what actions should be taken. Two intensive events were held for youth, giving them a venue to make comments, state concerns, and offer suggestions.

Environment Yukon also undertook a jurisdictional review and an inventory of current Yukon government actions on climate change.

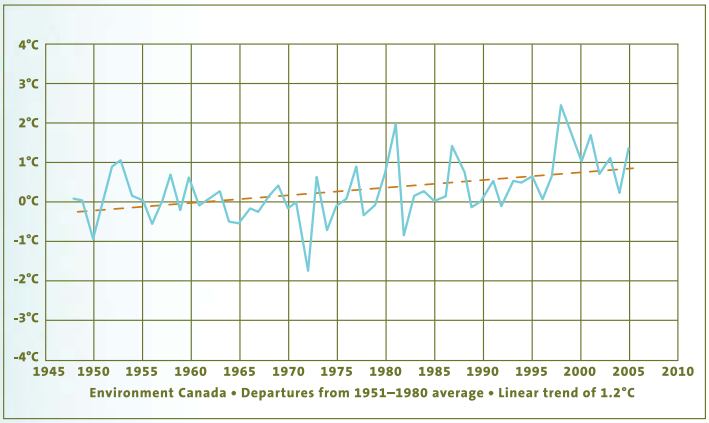
Since the release of the Climate Change Strategy, Yukoners have voiced increased concern about global and local climate change. They have also shown an increased commitment to doing something about it – and a keen interest in participating in discussions on what should be done.

A draft of the Climate Change Action Plan was circulated for public comment from May 12 to July 31, 2008. This plan is the end result of the views and values put forward by many individuals and organizations over the last two years.

IMPACTS OF CLIMATE CHANGE IN YUKON

According to the Intergovernmental Panel on Climate Change (IPCC), the overall temperature of the globe has risen 0.74°C over the past century. Environment Canada reports that Canada's average temperature has risen about 1°C between 1950 and 2000 as depicted in Figure #1. According to the *Arctic Climate*

Figure 1: Annual National Temperature Departures and Long-Term Trends



Source: Environment Canada Climate Trends and Variations Bulletin, 2005

information

You can find the following climate change related documents on the Environment Yukon website (**www.environmentyukon.gov.yk.ca**):

- Government of Yukon Climate Change Strategy (2006)
- A Snapshot: Yukon Government Actions on Climate Change during 2006 & 2007
- Scoping the Government of Yukon Climate Change Action Plan: Workshop Report, November 2007
- Yukon Youth Outside (the box) Final Report, December 2007
- 'What We Heard' summary of comments on the draft Yukon Government Climate Change Action Plan
- Draft Yukon Government Climate Change Action Plan (May 2008)

Impact Assessment (2004), winter temperatures in Alaska and western Canada (including Yukon) have increased by as much as 3-4˚ C in the same time period.

Climate change impacts are classified as being one of two general types: bio-physical impacts include physical changes to northern landscapes and ecosystems; socio-economic impacts arise from bio-physical impacts and are expected to change how all Yukoners live and work. These impacts were outlined in some detail in 2004 in the *Arctic Climate Impact Assessment*, which also predicted the following for Yukon:

- Higher year-round temperatures — winters warming more than summers, with winter warming being greater farther north; summers warming more in south and central Yukon than in the north, due to the moderating effect of the Beaufort Sea.
- More precipitation in the winter, with the change being greater farther north. There will be little change in average summer precipitation levels.
- More extreme weather events, both in winter and summer, including heavy summer rainfall and thunder storms.

This Action Plan is based on a common understanding that climate change is happening, that human behaviour is a contributor, and that a coordinated response is needed.

Flooding on the North Klondike Highway in August 2008

YUKON'S STRENGTHS AND RESOURCES

Yukon government regulations, policies and programs can be used to respond to climate change—see Appendix 2 for further information about government departments' climate change-related programs. We cannot, however, address climate change alone.

definitions

Climate – The average weather for a particular region and time period.

Adaptation –Taking actions that can prevent or reduce the negative impacts of climate change and/or build on the positive impacts. For example, altering infrastructure maintenance and construction in response to melting permafrost.

Greenhouse gases (GHGs) – Includes water vapour, carbon dioxide, methane and nitrous oxide.

Greenhouse gas emissions – The release of substances that can be transformed into greenhouse gases and/or the direct release of greenhouse gases into the atmosphere.

"(Youth are) concerned about the future. There are so many changes happening so quickly and more action is needed."

– Participant at 2007 Youth Engagement Forum

A Spruce Bark Beetle infestation is responsible for these dead and dying trees near Haines Junction.

Recently Yukon has experienced some extreme weather events:

- Yukon's 2004 fire season was the largest on record, doubling the previous record
- Extensive flooding in 2007 in the Southern Lakes region
- Flooding in 2008 closed the North Klondike Highway

Forging partnerships with other governments, organizations, and individuals will help the Yukon government develop a comprehensive and coordinated approach to addressing climate change. (See Appendix 3 for further information about partners.)

During the public consultation on the draft Action Plan, most people made it clear that they wanted and expected the Yukon government to take a leadership role. They wanted the Action Plan to set out specific actions and identify priorities. Yukoners also recognized that we all have a role in reducing GHG emissions and coming up with ways to adapt to change.

Yukoners have proven experience in research, public education, and energy solution programs. Traditional knowledge is also important in helping to understand climate change impacts and developing adaptation strategies. We can and will build on these strengths and resources.

SUMMARY OF ACTIONS

The Climate Change Action Plan identifies actions already underway as well as actions to come that will effectively enhance the Yukon government's response to climate change.

The actions support one or more of the goals of the Climate Change Strategy. Most actions serve more than one purpose. For example, monitoring water flow and ice breakup is used to assess flood risk for communities. Over time this information can help us understand water flow and ice breakup trends and identify adaptation measures.

ACTION PLAN PRIORITIES

A key priority of the Action Plan is to **enable effective adaptation** to climate change in Yukon. No matter how much we reduce our greenhouse gas emissions, climate change will continue for many years. We therefore need to adapt.

The Action Plan **responds to public needs**. We plan to use a phased approach to implement timely actions that give tangible results in terms of our ability to understand, adapt to and mitigate climate change.

The Action Plan recognizes that the Government of Yukon cannot address climate change alone. Priority will therefore be given to **forging partnerships** with other governments, organizations and individuals to facilitate a comprehensive and coordinated approach to addressing climate change in the territory.

The Yukon Geological Survey is studying how permafrost and landslides affect Yukon terrain. This information will allow scientists to predict how climate change will affect terrain disturbances in future, which has implications for infrastructure such as highways and pipelines. (Kluane Lake, July 1988)

Melting permafrost is exposing graves and cultural resources at Herschel Island.

definitions

Permafrost – The layer of permanently frozen ground that underlies more than half of Yukon. Permafrost exists wherever ground temperatures remain at or below 0 degrees Celsius throughout the year.

Permafrost Health Outreach Program – The University of Alaska and Yukon government have partnered to install long-term permafrost monitoring systems near several Yukon schools. The program will allow students to monitor local permafrost changes and will also support academic research on permafrost, climate change and infrastructure.

RECOMMENDED ACTIONS, BY GOAL

The Action Plan gives effect to the goals of the Climate Change Strategy:

1. **Enhance our knowledge and understanding of climate change**
   The actions we will take to advance this goal focus on research and understanding. Additional work in future is needed to support public education and training. The Yukon government already has several research and training programs underway, such as monitoring development and administering scientific research permits.
2. **Improve our ability to adapt to climate change**
   The actions we will take to advance this goal focus on the areas of infrastructure, water, and forests. Additional work currently underway is also identified in the areas of biodiversity, land use planning, human health, community adaptation planning, emergency response planning, agriculture, and building standards. For example, the Yukon government, in collaboration with other governments and academics, is participating in several permafrost projects, given the significant effects thawing is having on roads and buildings.
3. **Reduce our greenhouse gas emissions**
   The actions we will take to advance this goal focus on the Yukon government's operations, the transportation sector, and buildings (commercial and residential). For example, the Yukon Housing Corporation offers a wide range of programs to help Yukoners build energy efficient homes and also help existing homeowners to repair, upgrade and improve the energy efficiency of their existing homes. The Energy Solutions Centre also offers a number of programs to help reduce energy use and greenhouse gases. As well, the government has begun 'greening' our vehicle fleet by switching to more fuel efficient cars and developing policies to encourage more effective use.
4. **Lead Yukon action in response to climate change**
   The actions we will take to advance this goal focus on emission targets, leadership, reporting, and coordination. The Yukon government will continue to work with other governments on climate change initiatives at a national and international level.

Arctic Lupine covers a knoll on Herschel Island. Vegetation change in Yukon is one impact of climate change.

'PRIORITY' VERSUS 'ONGOING'

The Climate Change Action Plan recognizes that the Yukon government must concentrate on the challenges and opportunities that are most relevant to our circumstances.

'Priority' actions will build on work already underway and contribute to the government's long-term response to climate change. The 'ongoing' actions are areas where we are currently taking action but recognise that more is needed. In some instances, future work requires additional information, research, regulations, policies, infrastructure or additional resources. We heard during the public consultation that we needed to be clear about which actions would be done first – people recognized we would not be able to do everything at once.

LINK TO THE ENERGY STRATEGY FOR YUKON

Climate change and energy are inextricably linked. The Energy Strategy for Yukon and the Climate Change Action Plan were developed at the same time to help ensure they dealt with common issues in a consistent manner. For example, developing new hydro energy sources will further reduce GHG emissions while increasing energy supply.

The Energy Strategy identifies goals, principles, and actions related to the development of energy resources in Yukon and the management of energy. While actions already underway in the following areas are noted in the Action Plan, it is the Energy Strategy that deals in detail with:

- energy conservation and efficiency
- electricity production, distribution and supply
- alternate and renewable energy production, and
- energy resource development.

definitions

Renewable energy – Energy that comes from sources renewed on an ongoing basis through natural processes. Examples include the sun, the wind, wood, flowing water, or relatively warm ground, air or water temperatures.

The *Energy Strategy for Yukon* — released in January 2009 — sets out a long-term vision for the responsible development of energy resources. The Strategy can be downloaded at **http://www.emr.gov.yk.ca/energy/energy_strategy.html**

ACTIONS IN DETAIL

Regional climate change scenarios – Climate change scenarios will help researchers understand how Yukon's climate is changing and trends for the future. Scenarios describe possible future climate and can project climate variability and changes, such as those associated with precipitation or extreme weather events.

Yukon Alternative Energy Demonstration Project

In 2008 a hybrid, solar and wind renewable energy demonstration project was refurbished at Yukon College and put on public display. This project included a partnership between the Yukon government, the Northern Research Institute and Yukon College.

GOAL 1: ENHANCE OUR KNOWLEDGE AND UNDERSTANDING OF CLIMATE CHANGE

Priority: Research

In order to respond to climate change we must learn about and understand it, accepting that climate change and supporting science is continually evolving. To further knowledge development, the Yukon government must support and be actively engaged in research. This will help us better understand what changes are occurring and how to incorporate new knowledge into decision making.

Work now underway in this area... includes leading and participating in research projects across the territory on a variety of topics from geology to agriculture to biological diversity. Information on these activities is regularly shared with the public through reports, workshops, presentations, news releases and the Yukon government website. The research priority also includes administering a permitting process and collecting results through Yukon Archives.

Actions to be undertaken ...

- **Establish a Yukon Research Centre of Excellence**
  Effective coordination and distribution of research in the territory ensures that information gets to the people who need and will use it. The Centre of Excellence will facilitate research and help achieve a number of other climate change objectives related to monitoring and research, adaptation, and reducing GHG emissions.
- **Establish climate change research study areas**
  Undisturbed natural ecosystems are needed for monitoring and research to support climate change research projects in Yukon. These ecosystem study areas will support the gathering of knowledge required to understand and respond to climate change. These study areas will become part of national and international monitoring networks.
- **Develop regional climate scenarios**
  Understanding how the climate may change over time helps us make informed planning and management decisions. 'Regional Climate Scenarios' would show the variety of climatic conditions that could be experienced in Yukon and the challenges those changes may pose for a community or a profession, such as engineering.

Yukon College, a central hub for northern research.

GOAL 1 CONTINUED...

ONGOING: PUBLIC EDUCATION

Climate change affects us all. In order to be able to adapt and take action to reduce our contribution to it, we all need to be aware of the impacts, consequences and potential responses.

Work now underway in this area... includes providing public presentations and maintaining networks to disseminate climate change information. Examples include incorporating climate change information in school curriculum materials, and providing financial support to the Northern Climate ExChange for public education and outreach.

Actions to be undertaken... Government will identify additional opportunities to share climate change information with the public, especially in those areas where we have a direct role, e.g. public education.

ONGOING: TRAINING

Some sectors will be affected more than others by climate change, for example building construction. Construction methods will need to be adjusted in order to adapt to climate change impacts as well as reduce GHG emissions. Some sectors will need to modify their business operations. Training and education will raise awareness of how climate change may affect specific sectors and provide advice on how to best respond.

Work now underway in this area... includes training such as courses on fuel efficiency for fleet vehicles, energy evaluator skills, self-help courses for home builders, and alternative energy systems for heating and training on the Leadership in Energy and Environmental Design (LEED) standard.

Actions to be undertaken... Government will identify additional training opportunities based on need and demand. We will look to expand programming to professionals based on demand.

definitions

Northern Climate ExChange (NCE) – As part of the Northern Research Institute of Yukon College, NCE provides a credible independent source of information, develops shared understanding and promotes action on climate change in northern Canada.

Students in Faro are part of the Permafrost Health Outreach Program.

The Yukon government, in partnership with University of Alaska, is field testing permafrost adaptation techniques to reduce costly and dangerous frost heaves on Yukon highways.

The Yukon government, through the Northern Strategy Trust Fund, has helped the Yukon River Inter-Tribal Watershed Council undertake specialized water quality monitoring of the Yukon River Basin. This international research project is gathering climate change-related baseline data. The project trained eight Yukon First Nations members in water quality testing. This water data then can be analyzed to monitor the Yukon River for changes. The intensive sampling program began in 2008 and will continue until 2010.

GOAL 2: ADAPT TO CLIMATE CHANGE

Priority: Infrastructure

The Yukon government has an enormous investment in infrastructure including roadways, bridges, airports, buildings and underground water and sewer lines. We need to consider the impacts of climate change when planning and maintaining our infrastructure to ensure it is safe, available for use, and fiscally responsible.

Work now underway in this area... includes experiments with different road building techniques to reduce permafrost degradation, monitoring permafrost and terrain hazards to inform planning, and keeping up to date on construction developments to ensure new builds are meeting national guidelines.

Actions to be undertaken...

- **Complete a Yukon infrastructure risk and vulnerability assessment and determine adaptation strategies needed in response**
  Yukon's infrastructure is vulnerable to changes in climate, such as precipitation and freeze-thaw cycles. This assessment will measure the risk to government-owned infrastructure and identify adaptation strategies to inform future planning.
- **Develop an inventory of permafrost information**
  Changes to permafrost pose a large risk to Yukon infrastructure. This project will document past and present geological conditions in order to determine potential future changes to ground conditions, which will in turn help inform decision making.

White Sweet Clover is an invasive species in Yukon. At more than two metres tall it can obscure a driver's view of signage and wildlife, creating a serious hazard for motorists.

GOAL 2 CONTINUED...

Priority: Water

Water is essential to life in Yukon including drinking water, fish and wildlife, electricity production, and recreation. We need to continue to monitor the impacts of climate change on water in order to best protect public safety, property and the environment.

Work now underway in this area... includes ongoing monitoring of water systems across Yukon, e.g. monitoring stream flow and snow pack levels. Flood forecasting is also conducted and used by emergency response agencies and the public to help protect public safety and private property.

Actions to be undertaken ...

- **Complete a Yukon water resources risk and vulnerability assessment**
  The quantity and quality of Yukon's water resources, both ground and surface, are expected to change due to climate change. Understanding the risks and vulnerabilities posed to Yukoners by these changes is an essential step to developing a response and ensuring water management decisions are being made with the best information available.
- **Create a tool to facilitate the collection and distribution of water quantity and quality data**
  A variety of water data is collected across the territory by governments and the private sector. A tool that centralizes this data will provide access to this valuable information for use by decision makers responsible for managing water in Yukon.

In 2004, more forest burned in Yukon than in the rest of Canada combined.

Priority: Forests

The Yukon government needs to assess the risks that climate change poses to forest health and find out ways to respond to them. Forests are important to our economy, provide a vital carbon sink, and support biodiversity.

Water management in the territory involves the interests of:

- Yukon government
- Federal government
- First Nation governments
- Municipalities
- Boards and Councils
- Stakeholders

Work now underway in this area... includes the ongoing operation of the Model Forest Special Project Area, government support for the Strategic Forest Management Plans now being developed and implemented by the Champagne and Aishihik First Nations and the Teslin Tlingit Council, and support to the University of British Columbia and the Northern Climate ExChange's work to build an environmental information base for Yukon.

Actions to be undertaken ...

- **Conduct a Yukon forest health risk assessment**
  The health and viability of Yukon forests is sensitive to climate change. This assessment would identify past, present and future forest health concerns, identify appropriate monitoring systems, and suggest strategies for adaptation.
- **Conduct treatments to reduce forest fuel loads and protect communities**
  Scientists confirm that the average temperature is rising in Yukon, which in turn increases the risk of forest fires. Fire Smart is a successful program that reduces the fuel load within communities, helping to protect them from forest fires. Plans to reduce the fuel load in large areas outside of communities are needed to further protect communities.
- **Conduct a Yukon forest tree species and vulnerability assessment**
  It is expected that changes in climate will shift the tree line. Identifying the vulnerabilities of Yukon tree species to climate change and options for adaptation will inform Yukon forest management decisions.

Ongoing: Biodiversity

Yukon is rich with a wide variety of flora and fauna. Climate change may threaten this diversity. Yukoners rely on flora and fauna for food, business, and recreation. We need to understand how biodiversity is affected by climate change.

Work now underway in this area... The Yukon government currently participates and leads a number of monitoring programs that contain climate change elements, such as the Wolf Creek Research Basin and the Arctic Borderland Ecological Knowledge Co-op.

Actions to be undertaken... We will continue to work with partners on monitoring programs, including the long term monitoring of species of high value to Yukoners. Expanding programming or monitoring of invasive species will be considered in the future.

GOAL 2 CONTINUED...

Ongoing: Land Use Planning

Climate change will affect how land is used and managed. Land use planning is taking place across Yukon on many levels. These land use plans will need to ensure the implications of climate change are considered and incorporated.

Work now underway in this area... The Yukon government is currently involved in a number of regional and local land use planning projects across Yukon.

Actions to be undertaken... We will continue to participate in these planning exercises and bring the relevant knowledge available about climate change to the table for consideration.

The Yukon government participates in numerous monitoring programs with climate change components, including:

- Wolf Creek Research Basin
- Porcupine Caribou Herd Body Condition Assessment
- Kluane Ecosystem Monitoring Project
- Mammalian Biodiversity Monitoring.

Ongoing: Human Health

The extent of the impacts climate change will have on human health and well-being in Yukon are currently unknown. Climate change could result in an increase in vector born diseases, lack of access to fresh fruit and vegetables, agricultural products, and indigenous meats or a general decline in health and well-being due to changing weather patterns. Depending on how climate change affects Yukon over time, the reverse could also be true. Warming trends could make it possible to increase agriculture.

Work now underway in this area... includes monitoring health trends to identify and develop responses and providing Yukoners with essential health services that are responsive to demands and change.

Actions to be undertaken... We will continue to monitor health trends, evaluate our health programs and keep services responsive to changing priorities and demand.

- The Government of Canada released *Human Health in a Changing Climate: A Canadian Assessment of Vulnerabilities and Adaptive Capacity* in 2008.
- This report identifies important health considerations as a result of climate change.

The Marsh Lake Flood Response Incident Management Team received the Premiers Award of Excellence for its response to flooding in the summer of 2007.

Climate change is likely to cause a cascade of impacts on animals, including the Southern Lake caribou pictured here.

- The Northern Climate ExChange, funded by the Yukon government through the Northern Strategy Trust, is currently in the process of completing a Climate Change Adaptation Plan for Dawson City. This plan seeks to identify Dawson-specific initiatives for building community resilience to a changing climate. These initiatives will be identified in the short-term, mid-term and long-term (5-20 yrs, 20-50 yrs and 50-100 yrs).

Ongoing: Community Adaptation Planning

Adaptation to climate change happens at the local level. Communities require support in order to make informed decisions regarding climate change. Yukon communities are already moving forward on the planning that is required to respond to climate change, including completing community sustainability plans.

Work now underway in this area... includes providing support through the Northern Strategy Trust Fund to the Northern Climate ExChange to assist three Yukon communities to develop and implement community adaptation plans.

Actions to be undertaken... We will continue to support community-level adaptation planning with technical advice and expertise as well as financial resources.

Ongoing: Emergency Response Planning

Climate change may bring more frequent extreme weather events such as storms, forest fires and floods. It is important to be prepared for emergencies so as to ensure public safety and security.

Work now underway in this area... includes planning and assistance to Yukon communities in developing their own emergency response plans.

Actions to be undertaken... We will continue to work proactively to identify potential new or expanded threats or events that might be the result of climate change in Yukon and develop or update response plans as necessary.

Agriculture in Yukon may expand northward, beyond this Carcross farm, as a result of climate change.

GOAL 2 CONTINUED...

Ongoing: Agriculture

Climate change and rising temperatures may provide new agricultural opportunities in Yukon. Changes to Yukon's water regime may provide a positive impact in some areas and negative in others. Supporting the local production and sale of agricultural products will reduce food transportation costs and increase local sustainability for Yukoners.

Work now underway in this area... includes supporting the local production and sale of agricultural products through the provision of information, expertise, promotions and project support.

Actions to be undertaken... We will continue to work with local producers to enhance the production and supply of agricultural products. We will also prepare for the opportunities or threats to the agricultural community as they become apparent.

Ongoing: Building Standards

Climate change will affect the environmental health and safety of our buildings. This may include issues related to changes in ground stability from melting permafrost, air temperature, moisture and winter snow loads.

Work now underway in this area... includes regulating and enforcing building standards and working with other jurisdictions to keep up to date on building standard best practices and guidelines.

Actions to be undertaken... We will work to alter building standards to address these issues.

GOAL 3: REDUCE OUR GREENHOUSE GAS EMISSIONS

Priority: Yukon Government Operations

The Yukon government owns and operates a large number of buildings and vehicles. We also participate in activities that produce GHG emissions such as field work with aircraft and operating heavy machinery for snow clearing and road maintenance. The Yukon government will demonstrate leadership by reducing GHG emissions from our operations. As most GHGs from our operations are produced from burning fossil fuels, this commitment is both environmentally and fiscally responsible. Some of these actions are jointly being undertaken with the Energy Strategy for Yukon.

Work now underway in this area... includes actively adapting our light and heavy vehicle fleets. In the light fleet, work is underway to: reduce the size of the fleet; reduce the total distance driven; reduce idling rates; provide cost incentives to drive more fuel efficient vehicles; and reduce the proportion of larger vehicles in the fleet. In the heavy fleet, work is underway to: reduce and monitor idling time; improve preventive maintenance routines; improve tire performance; convert used engine oil to furnace oil; and recycle used anti-freeze. This priority also includes supporting enhanced recycling and composting within some departments to increase landfill diversion and building tools to track energy use in government buildings.

- The Mayo-Dawson transmission line continues to displace 10,000 tonnes of GHG emissions each year.
- Phase 1 of the Carmacks to Stewart Crossing Transmission Line was completed in fall 2008 and will reduce GHG emissions by 23,000 tonnes per year.
- $5 million was allocated to install a third hydro turbine at the Aishihik hydro electric plant. This addition will reduce GHG emissions by up to 3800 tonnes a year.

Yukon Energy can generate up to 112.4 megawatts (MW) of power, of which 75.4 MW comes from hydro, 0.8 MW from wind, and the rest from diesel.

Actions to be undertaken...

- **The Yukon government will meet the following emission reduction targets in its internal operations: cap GHG emissions in 2010, reduce GHG emissions by 20% by 2015 and become carbon neutral by 2020**
  A target is essential to measure long-term progress. Targets for an absolute reduction in GHG emissions from government's internal operations will in part be met by the actions identified below. New actions will be identified and completed in the future to keep us on track to meet these targets.
- **Report on Yukon government operations through 'The Climate Registry'**
  A reporting mechanism is required in order to measure and track progress against the target. The Climate Registry is a third party verification organization which provides tools and support to track GHG emissions. The government will publicly release the compiled emission reports annually.

continued

GOAL 3 CONTINUED...

- **Develop a carbon offset policy for internal operations**
  A policy will be developed to help us offset the emissions produced by our operations to reach our target of becoming carbon neutral. This policy will focus on encouraging investment in Yukon-based businesses and initiatives.
- **Incorporate environmental performance considerations in the government's procurement decisions**
  The Yukon government purchases a wide variety of goods and services. We will establish a green procurement policy to ensure our purchasing choices are both environmentally and fiscally responsible.
- **Government-funded new residential construction will meet GreenHome energy efficiency standards**
  The energy efficiency of a home affects its long-term operation and maintenance costs as well as its GHG emissions. Using GreenHome standards for all new housing built by the Yukon government will enhance the energy efficiency of Yukon's housing stock.
- **Government-funded commercial and institutional, construction and renovation will meet or exceed the LEED Certified Standard for energy efficiency**
  The energy efficiency of a building affects its long-term operation and maintenance costs as well as its GHG emissions. Ensuring the Leadership in Energy and Environmental Design (LEED) certified energy efficiency standard is met on all new commercial and institutional buildings renovated or built by the Yukon government will help reduce long term operation costs and decrease GHG emissions.
- **Improve energy efficiency and reduce the greenhouse gas emissions of the government's light vehicle fleet**
  After heating buildings, transportation is the largest producer of GHG emissions for the Yukon government. Building on the work now underway, we will continue replacing older equipment with more fuel efficient models, which will in turn reduce GHG emissions substantially.

continued

definitions

Carbon Neutral – Means maintaining an equal balance between producing and using carbon. For example, the production of carbon-dioxide emissions can be off-set, or made neutral, by undertaking carbon reducing activities such as planting trees in urban areas or buying carbon offsets from a wind energy company.

Carbon Offsets – An emission reduction credit from another organization's project that results in less carbon dioxide or other GHGs in the atmosphere than would otherwise occur. Carbon offsets are typically measured in tons of CO_2 – equivalents (or 'CO_2eq') and are usually bought and sold through a number of international brokers, online retailers, and trading platforms.

Carbon Capture and Storage – A mitigation approach to reducing GHG emissions which is based on capturing carbon dioxide (CO_2) and storing it, e.g. capturing CO_2 emissions from power plants and injecting it deep into the ground.

Environment Yukon staff have been using a Smart Car since 2007.

The new Tombstone Interpretive Centre will meet Leadership in Energy and Environmental Design Standards (LEED).

The Athletes Village for the 2007 Canada Winter Games was built to the Yukon Housing Corporation's GreenHome design standard.

- **Implement an Environmental Stewardship Initiative for the Department of Education and Yukon schools**
  School buildings are some of the biggest energy users in Yukon. They also house many minds that are interested and concerned about climate change. The Department of Education will work with schools on ways to identify how they can reduce their ecological and carbon footprint and provide opportunities for students and teachers to take meaningful action.
- **Establish "Green Action Committees" in all departments**
  Staff involvement affects government's ability to develop and implement actions to reduce GHG emissions. Each department will establish Green Action Committees to help identify, develop and implement actions to further support the reduction of GHG emissions within departments.
- **Conduct an energy analysis of all Yukon government buildings and complete energy-saving retrofits**
  Energy use in buildings has been the biggest contributor to GHG emissions within our operations. Completing an energy analysis will help identify the buildings that require action first and identify the retrofits that are required.
- **Develop best management practices for industry to reduce GHG emissions**
  Industry and business play a big role in the production of GHGs in Yukon. Helping industry and business reduce their GHG emissions will also help them reduce fuel costs. Starting with the oil and gas sector we will develop best management practices to reduce GHG emissions.

63% of the Yukon's 2006 GHG emissions were from transportation. (*National Inventory Report 1990-2006. Greenhouse Gas Sources and Sinks for Canada*)

GOAL 3 CONTINUED...

Priority: Transportation
The transportation sector contributes approximately 60 per cent of Yukon's GHG emissions. Reducing emissions from this sector will significantly affect Yukon's overall GHG contribution to climate change.

Work now underway in this area... includes supporting voluntary air emissions vehicle testing clinics, encouraging the local production of goods (agricultural and other) to reduce emissions from transportation and supporting alternative-fuel manufacturing and use in Yukon.

Actions to be undertaken...

- **Undertake an extensive study of the transportation sector and recommend options to reduce emissions**
  A better understanding of the transportation sector is required in order to move forward on actions to reduce emissions. This study will provide additional knowledge about where the emissions are created within the transportation sector and identify opportunities to reduce GHG emissions.
- **Develop incentives for fuel efficient transportation**
  Using more fuel efficient methods of transportation is one way to reduce GHG emissions. Incentives will be considered to encourage the purchase of fuel efficient vehicles as well as promote public and active modes of transportation.

The Yukon Housing Corporation operates from offices at 410H Jarvis Street. Their website is: **www.housing.yk.ca.** Some of the programs offered are:

- **Alternate Energy System Program** – Financial support to install alternate energy systems such as solar, wind, micro-hydro or heating systems such as heat pumps and heat exchangers in the home
- **Home Repair Enhancement Program and Rental Rehabilitation Program** – Loans for home and rental energy efficiency repairs such as window replacement and furnace upgrade
- **GreenHome Incentive** – Financial support to upgrade existing homes or build new homes to meet GreenHome standards
- **Home Energy Evaluations** – Grant for homeowners who have energy evaluations performed on their homes. Energy advisors perform an on-site assessment and submit a personalized report with recommended repairs to improve the home's energy efficiency.

Yukon's first SuperGreen houses in Watson Lake incorporate the most energy efficient construction standards in Canada.

Priority: Commercial and Residential Buildings

Approximately 30 per cent of the Yukon's GHG emissions come from heating our residential, commercial and institutional buildings. Reducing fossil fuel use in space heating will help reduce GHG emissions as well as reduce operating costs for the building owner.

Work now underway in this area... includes Yukon Housing Corporation programs that support the construction and renovation of homes to meet health and safety standards as well as energy efficiency standards. The Yukon government is also working with our inter-jurisdictional counterparts to enhance and revise national building standards with regards to energy efficiency and pilot a variety of energy efficient and renewable energy technologies.

Actions to be undertaken...

- **Develop pilot projects to demonstrate home and commercial energy efficiency and heating technology**
  Increasing energy efficiency and utilizing non fossil fuel-based heating systems are an essential part of reducing emissions from space heating in both home and commercial buildings. Testing the viability and feasibility of technologies, especially for a cold climate, will help inform building owner decisions on space heating in the future.
- **Improve access to home energy evaluations by providing evaluator training**
  A home energy evaluation utilizes trained local evaluators to provide useful and specific advice to homeowners. This information will help homeowners make informed decisions to increase energy efficiency. There are currently not enough evaluators in Yukon to meet the demand and more are required. The Yukon government will provide the training needed to establish more evaluators.
- **Develop wood energy opportunities for residential and institutional heating**
  Burning wood efficiently to heat buildings produces less GHG emissions than burning oil. Supporting ways to efficiently use wood heat will help reduce GHG emissions as well as develop local economic opportunities for Yukon's forestry industry.

Ongoing: Solid Waste Sector

The solid waste sector produces the fifth highest amount of GHGs in Yukon. Methane is released from decomposing organic material in landfills and is a more damaging GHG than carbon dioxide. There are about 20 successful recycling and composting programs around the territory, but more can be done to support their efforts and encourage new programs to start.

Work now underway in this area... includes funding programs for recycling depots and non-governmental organizations to reduce waste generation, promote public awareness, and encourage diversion, as well as administering the Yukon Solid Waste Regulations.

The Energy Solutions Centre (ESC) operates from their office at 206A Lowe Street. Their website is: **www.nrgsc.yk.ca**

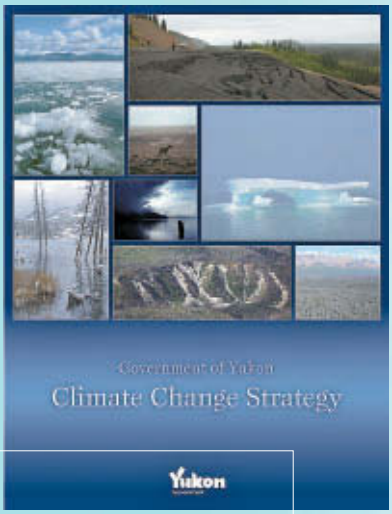
A couple of the services and programs ESC offers for federal and Yukon government programs are:

- delivering energy efficiency and renewable energy programs in Yukon, and
- distributing information on energy efficiency and renewable energy technology and programs.

Logging near Watson Lake.

definitions

Carbon Dioxide (CO_2) – A heavy colourless gas formed by the burning of fossil fuels such as coal, oil and natural gas. It is also formed in animal respiration and in the decay or combustion of animal or vegetable matter. CO_2 is absorbed from the air by plants through photosynthesis. The IPCC recognizes CO_2 as the principal contributor to increasing atmospheric levels of GHGs.



"The Yukon government will demonstrate climate change leadership" – Government of Yukon Climate Change Strategy, September 2006

did you know?

The Yukon government is part of the national effort to create a Canada-wide framework for Industrial Air Emissions.

Actions to be undertaken... We will continue to provide the Waste Reduction and Recycling Initiative and build on opportunities to expand support for community recycling programs. The Yukon government is undertaking a study to review the administration and operations of territorial solid waste sites. This review is intended to assist the government with determining sustainable management practices for the solid waste sites. The study will examine aspects such as the sustainability and viability of different disposal methods along with the associated environmental impacts, such as carbon footprint and emissions.

GOAL 4: LEAD YUKON ACTION IN RESPONSE TO CLIMATE CHANGE

Priority: Emission Targets

In order to provide clear expectations on GHG emissions, it is important to identify a Yukon-wide reduction goal. Yukon has already seen a significant reduction in its GHG emissions. Emissions in 2006 were more than 27 per cent lower then emissions in 1990.

Work now underway in this area... includes voluntary reporting of GHG emissions to Natural Resources Canada and Environment Canada.

Actions to be undertaken...

- **Forecast potential future GHG emissions for Yukon**
  The potential for future emissions is important to consider when establishing a reduction target. This project will include current territorial trends and potential development scenarios. This information will help identify policies, regulations, or technologies that will help meet our Yukon-wide reduction target.
- **Work with federal partners to ensure national GHG reporting is accurate and consistent for Yukon**
  Federal departments currently report on GHG emissions for provinces and territories. An accurate and consistent reporting mechanism is essential to track progress on meeting a reduction target. By working with our federal partners, we will ensure that the national reporting mechanisms are appropriate for Yukon.
- **Set a Yukon-wide emissions target within two years**
  A Yukon-wide GHG emissions target will provide clarity. Technical research and analysis will be undertaken to develop a Yukon-wide reduction approach. The target will be developed in a manner that shows our commitment to reducing our contribution to climate change, yet still allows for responsible growth of our population and development of our resource based industries.

GOAL 4 CONTINUED...

Priority: Leadership
The Yukon government can and will provide leadership on climate change in the north. Yukoners are feeling the effects of climate change and urgent action is needed.

Work now underway in this area... The Yukon government developed the Climate Change Strategy as well as this Climate Change Action Plan. We have also begun developing important partnerships, including the development of the Yukon Cold Climate Innovation Centre.

Actions to be undertaken...

- **Create a Climate Change Secretariat**
  Government-wide collaboration is essential if we are to provide a coordinated response to climate change, whether it is implementing actions or communicating regionally, nationally and internationally. The Climate Change Secretariat will be responsible for ensuring the effective implementation of the Action Plan as well as providing corporate leadership within government on climate change linked issues.
- **Determine the potential of a Yukon carbon market**
  Carbon trading systems have been established around the world and are creating a market for carbon. Market mechanisms could help develop new opportunities for Yukoners. This project will explore these opportunities and make a policy recommendation based on the findings.
- **Incorporate climate change consideration into government decision making**
  In order to make informed decisions, climate change needs to be considered in decision making processes. This will start with documents that provide advice to the Premier and Cabinet to be expanded to other levels of government decision making.

Priority: Coordination
In order to develop a comprehensive response to climate change, the Yukon government must work in partnership at the local, regional, national and international levels. These partnerships are required with all orders of government, business, industry organizations and individuals.

did you know?

The Yukon government is part of the national effort to create a Canada-wide framework for Industrial Air Emissions. The framework would target and regulate large final emitters. The government supports the effort to limit emissions provided it doesn't unduly restrict or impede economic growth in Yukon.

The Yukon government has held Yukon Youth Outside (the box), a youth engagement forum on climate change, in 2007 and 2008.

Work now underway in this area... includes participating in national and international climate change forums, engaging youth through an annual engagement forum, and participating in numerous sector specific working groups and national organizations considering climate change.

Actions to be undertaken...

- **Create a community engagement forum for taking action on climate change**
  Many governments, organizations and individuals across the territory are responding to climate change. Facilitating inter-agency collaboration and partnerships among these bodies will help achieve a coordinated Yukon response to climate change. As a small jurisdiction, working together will be more efficient and effective.

Ongoing: Review and Report

In order to ensure accountability in implementing this Action Plan we must regularly and publicly report on progress.

Work now underway in this area... The Yukon government currently reports to the public on its work through a number of different venues, including reports in the legislature, the public release of reports such as the State of the Environment Report, and through the media.

Actions to be undertaken... The Yukon government will regularly report to the public on the progress made on implementing this Action Plan. We will also review and update this Action Plan as necessary.

did you know?

The Yukon government took part in the Climate Leaders Summit held in Poznan, Poland in December 2008. The summit let Yukon's delegation learn best practices of other jurisdictions and build networks to support our future climate change efforts. Yukon government representatives also attended portions of the United Nations climate change conference underway at the same time.

Yukon youth are keen to be engaged on climate change.

Did you know? Environment Yukon biologists and other researchers are involved in a 41 inventory and 17 wildlife management projects. Pictured here are members of the 40 Mile caribou herd where a lichen assessment is underway.

NEXT STEPS

The Climate Change Action Plan is part of the Yukon government's commitment to address climate change in the territory. The plan identifies priority actions to be undertaken right away that will involve several different departments.

During the public consultation, we heard the public expected us to take a visible and measurable approach and to show leadership. In response, we've ensured this Action Plan sets out the steps we will be taking in the immediate future as well as the actions we are already taking. We have made clear which areas the Yukon government will take the lead on.

The Yukon government will need a multi-party and multi-disciplinary approach to implement and coordinate this Action Plan. Government will need to work in partnership to effectively respond to climate change. We must also expand our technical expertise in climate change, especially the management and reduction of GHG emissions.

The Climate Change Action Plan identifies the many actions needed for an effective response to climate change. It sets out the policies, programs, and research the Yukon government will undertake or enhance. It shows how work already underway advances the goals first set out in the Climate Change Strategy.

Climate change likely played a role in this large landslide near Carmacks in 2006. Warming temperatures caused the permafrost layer to thin, thus weakening the soil strength.

did you know?

The Yukon government supports the principles of the Kyoto Accord reached in 1997.

Copenhagen, Denmark will host a major UN climate change conference in 2009 that, if agreement is secured, will put in place a successor treaty to the Kyoto Protocol of 1997.

Climate change and energy use are very closely linked – and what type of energy we use affects our GHG emissions levels. The Action Plan does not focus on energy sources and production in detail as these areas are dealt with by the Energy Strategy for Yukon. The Yukon government recognizes, however, that energy production, sources and use will significantly affect our efforts to adapt to climate change impacts.

Individual Yukoners must also find ways to adapt to, understand, or reduce their individual contributions to climate change. During the public consultation we heard that Yukoners are interested in taking personal action in response to climate change. While the focus of the Climate Change Action Plan is on actions the Yukon government will undertake to address climate change within its areas of responsibility, many actions do include the public, e.g. housing programs. (*See Appendix 6 for a list of climate change resources available to the public, including suggestions for individual action.*)

Work by the Yukon government and others in response to climate change will provide economic, social and other environmental benefits. It is essential that we all prepare for the impacts of a changing climate. Climate change is real, and it threatens our forests, our watersheds, and our way of life.

Ultimately, it will be the collective action of Yukoners that determine whether or not we will successfully adapt to climate change in the North. This Action Plan places a high priority on actions and programs that are accessible to the people of Yukon and benefit all members of the public.

APPENDIX 1: CLIMATE CHANGE AND GREENHOUSE GASES

According to the *Arctic Climate Impact Assessment* (2004), many climate change impacts are already being observed in the North. The assessment noted that:

- permafrost and polar ice are melting at unprecedented rates,
- sea levels are rising,
- coastlines are eroding,
- glaciers are receding,
- beetle infestations are occurring in our forests, and
- new species of animals and plants are moving into northern areas while other northern native species are declining.

The Intergovernmental Panel on Climate Change's (IPCC) *Fourth Assessment Report* (2007) found that the overall temperature of the globe has risen 0.74°C over the past century. Environment Canada reports that the country's average temperature has risen about 1°C between 1950 and 2000. According to the *Arctic Climate Impact Assessment* (2004), winter temperatures in Alaska and western Canada (including Yukon) have increased by as much as 3-4° C in the same time period.

Caribou calf.

How the Greenhouse Effect works:

Our planet is kept warm due to the greenhouse effect. This means that energy radiated by the earth is trapped by the atmosphere instead of escaping into outer space. GHGs (carbon dioxide, methane, and nitrous oxide) that trap this energy are usually found in the atmosphere at very low concentrations. However, the concentration of these gases is increasing and scientists believe this is, in part, a result of human activities such as the burning of fossil fuels.

Prior to the Industrial Revolution, the IPCC says that carbon dioxide (CO_2) concentration in the atmosphere was 280 ± 10 parts per million (ppm) for several thousand years. But, according to Environment Canada, the present atmospheric CO_2 concentration is above 360 ppm. This is the highest level of CO_2 concentration in our atmosphere in the past 420,000 years. These high concentrations are trapping more and more of the energy radiated from the earth which, in turn, is contributing to global temperatures and affecting our climate.

The *Arctic Climate Impact Assessment* report projected that the rate and magnitude of future temperature change will be greatest in high latitude regions of the Northern Hemisphere. The assessment predicted that average temperatures in the arctic may rise by as much as 4 to 7 degrees Celsius in the next 100 years.

According to the *Arctic Climate Impact Assessment* (2004), arctic sea-ice coverage has shrunk over the past 50 years. This Beaufort Sea iceberg is off the coast of Yukon.

GHGs and Global Warming:
The IPCC considers global climate change to be the most significant threat our environment faces today.

The IPCC believes there is a direct link between the increase of GHGs in our atmosphere and global increases in temperatures. For this reason, many jurisdictions are introducing measures to limit their GHG emissions. For instance, the Government of Canada has made climate change a priority and has developed emissions regulations and GHG reduction targets.

The most common GHG in our atmosphere is Carbon Dioxide (CO_2), which is formed through natural processes and by the burning of fossil fuels. Compared to the rest of the country, Yukon contributes only a small percentage of the total Canadian GHG emissions. According to Environment Canada's *National Inventory Report 1990-2006: Greenhouse Gas Sources and Sinks in Canada*, Yukon residents each produce approximately 12.6 tonnes of GHGs annually. According to the same report, this is below the national average of 22.1 tonnes.

Greenhouse Gas Emissions in Yukon:
In looking at Yukon GHG emissions by sector (*see Figure 2: Yukon Greenhouse Gas Emissions by Sector*), Environment Canada statistics show that:

- The cyclical nature of Yukon's resource economy significantly affects emission levels. Emissions were highest in 1996 and lowest in 2006. There was more activity in Yukon's mining industry in the 1990s than there is now.
- The transportation sector accounts for the largest share of GHG emissions in Yukon. In this sector, heavy duty diesel vehicles are the largest contributors. Other significant contributors include government, business, and personal vehicles.
- Off-road diesel use is a major contributor. This includes activities such as use of heavy mobile equipment in the construction, agriculture and mining sectors, and recreational vehicles such as snowmobiles and all-terrain vehicles (ATVs).
- The electricity sector can be a major contributor to GHG emissions when energy demands are high. When the demand for electricity exceeds Yukon's hydro generation capacity, diesel generators are used to make up the shortfall.

Figure 2: Yukon Greenhouse Gas Emissions by Sector

Greenhouse Gas Categories	1990	1995	2000	2001	2002	2003	2004	2005	2006
TOTAL (kt CO_2 eq)	**538**	**547**	**445**	**433**	**444**	**440**	**414**	**398**	**394**
ENERGY	**526**	**532**	**430**	**418**	**428**	**424**	**398**	**382**	**377**
a. Stationary Combustion Energy	**226**	**248**	**191**	**168**	**169**	**163**	**131**	**126**	**123**
Electricity and Heat	93.6	53.3	17.0	14.6	17.2	10.7	7.99	7.53	7.81
Fossil Fuel Industries	2.9	91	84	56	48	28	11	29	38
Mining & Oil and Gas	4.12	10.3	1.54	2.09	2.90	2.11	1.73	3.08	0.53
Manufacturing	8.01	0.47	—	0.03	—	—	—	—	—
Construction	5.46	4.45	2.40	1.64	1.58	2.65	1.95	1.07	1.06
Commercial / Institutional	81.9	60.8	52.9	51.2	53.1	58.5	40.0	39.8	30.4
Residential	29	19	33	29	31	41	55	39	39
Agriculture & Forestry	1.24	7.56	0.95	13.9	14.7	19.9	13.2	6.27	6.02
b. Transportation Energy	**300**	**280**	**240**	**250**	**250**	**260**	**260**	**250**	**250**
Domestic Aviation	21	21	23	16	15	20	22	22	27
Road Transportation (total)	180	218	162	165	168	164	160	157	144
Light Duty Gas Vehicles	79.1	72.5	48.9	47.2	45.6	45.0	39.1	34.3	28.5
Light Duty Gas Trucks	30.4	41.7	39.6	41.4	42.5	44.2	40.3	37.7	33.5
Heavy Duty Gas Vehicles	10.2	9.69	5.89	6.28	6.08	6.31	5.83	5.28	4.49
Motorcycles	0.46	0.41	0.32	0.32	0.35	0.38	0.35	0.32	0.27
Light Duty Diesel Vehicles	0.55	0.51	0.35	0.34	0.33	0.34	0.32	0.28	0.24
Light Duty Diesel Trucks	0.60	0.96	2.51	2.55	2.58	2.71	2.53	2.65	2.68
Heavy Duty Diesel Vehicles	57.2	88.0	63.5	65.5	69.0	63.6	69.9	75.2	72.7
Propane & NG Vehicles	1.5	4.0	0.68	1.0	1.6	1.9	2.1	1.1	1.5
Others (total)	100	40	50	70	70	70	80	70	80
Off Road Gasoline	10	8	10	10	10	10	3	3	2
Off Road Diesel	90	30	40	60	60	60	80	70	80
c. Fugitive Sources	**—**	**3.77**	**2.71**	**2.15**	**5.40**	**3.54**	**2.71**	**2.12**	**1.03**
Oil and Natural Gas	—	3.77	2.71	2.15	5.40	3.54	X	X	X
INDUSTRIAL PROCESSES	**1.38**	**2.09**	**0.71**	**0.61**	**0.99**	**0.75**	**0.49**	**0.56**	**0.56**
SOLVENT & OTHER PRODUCT USE	**0.18**	**0.22**	**0.24**	**0.21**	**0.16**	**0.21**	**0.20**	**0.17**	**0.31**
WASTE	**10**	**12**	**14**	**14**	**14**	**15**	**15**	**16**	**16**
a. Solid Waste Disposal on Land	**7.6**	**9.3**	**11**	**11**	**12**	**12**	**12**	**13**	**13**
b. Wastewater Handling	**2.9**	**3.2**	**2.9**	**2.8**	**2.8**	**3.0**	**3.1**	**3.1**	**3.1**

Source: Summary of GHG Emissions for Yukon: Environment Canada. National Inventory Report 1990–2006. Greenhouse Gas Sources and Sinks for Canada. 2008.

Notes: (1) — : Indicates no emissions. (2) X: Indicates confidential data. (3) kt CO_2 eq: Kilotons of CO_2 equivalent. (4) Emission totals in chart may not add up due to rounding protocol.

APPENDIX 2: YUKON GOVERNMENT DEPARTMENTS AND THEIR ROLES

The Yukon government can use regulations, policies and programs to respond to climate change.

Many different government departments are involved in climate change-related matters and will be active participants in the implementation of the Climate Change Action Plan. Departments have the following areas of involvement in climate change:

Community Services is responsible for local area planning in rural areas; vehicle licensing and registration (shared with Highways and Public Works); building codes and standards; emergency preparedness, operation of solid waste sites and infrastructure development.

Economic Development is responsible for programs to assist business development in the territory, including ones that may address new threats or opportunities presented by climate change.

Education is responsible for public education in Yukon, including the development of school curriculum that addresses climate change issues.

Energy, Mines and Resources is responsible for developing territorial energy policies; designing and delivering public programs on energy conservation and efficiency; managing the development of pipelines in the territory; forest resource management; geological, soil and permafrost surveys; agriculture; managing and regulating Yukon's mineral resources and oil and gas resources; and regional land use planning.

Environment is responsible for wildlife monitoring and management; biodiversity and ecosystem monitoring; air and water quality; hydrological monitoring; environmental education; territorial waste reduction and recycling programs; environmental protection; and the preparation of this Action Plan.

Executive Council Office is responsible for supporting the incorporation of northern technology, knowledge and experience in climate change plans and programs. ECO also supports intergovernmental relations, and provides corporate assistance and leadership with respect to assessment of development projects.

Health and Social Services is responsible for health care and health programs that may be needed to address climate change-related health issues.

Highways and Public Works is responsible for Yukon's highways, aviation and marine infrastructure (airports and ferries) and all government buildings and infrastructure, including fleet vehicles.

Tourism and Culture is responsible for managing heritage sites and artifacts; encouraging the preservation and rehabilitation of historic buildings; supporting Yukon's tourism industry and promoting best practices in the industry; providing licenses to researchers and scientists doing work in Yukon; and conducting research on the paleo-history of Yukon.

Yukon Development Corporation is a crown corporation of the Yukon government which works with the Yukon Energy Corporation to provide electricity and related energy services in the most economical yet environmentally and socially responsible way possible.

Yukon Energy Corporation is a publicly-owned electrical utility that operates as a business, at arms length from the Yukon government, and are the main generator and transmitter of electrical energy in Yukon. YEC works with its parent company, Yukon Development Corporation, to provide Yukoners with a sufficient supply of safe, reliable electricity and related energy services.

Yukon Housing Corporation is responsible for building and operating government-owned staff and social housing, and delivering numerous housing programs available to the public to help upgrade and repair homes and improve the energy efficiency of housing stock Yukon-wide.

University of Alberta scientists found permafrost just south of Dawson City that is about 740,000 years old.

APPENDIX 3: YUKON GOVERNMENT PARTNERS

The Yukon government is committed to building partnerships with other levels of government and non-government organizations to address climate change in Yukon. Climate change cannot be solely the responsibility of one government or organization – a comprehensive and coordinated approach to adaptation, reducing GHG emissions and research is needed.

Partners in the Yukon government's response to climate change could include:

Government of Canada: The Government of Canada sets and promotes broad goals for addressing climate change at the national level, sets related federal regulations and standards and has a number of initiatives related to climate change in place. It has funding programs designed to support climate change work by other organizations, including initiatives in the North. Canada also participates in international forums and agreements on climate change.

Inter-governmental Forums: Inter-governmental and international forums that address climate change and network on related topics include, but are not limited to, groups such as the Canadian Council of Ministers of the Environment, the Canadian Council of Resource Ministers, the Canadian Council of Forest Ministers, the Council of the Federation, the Western Premiers Forum, the Northern Premiers Forum, and the Arctic Council.

Non-government Organizations: Several Yukon-based NGOs are involved in climate change initiatives.

Privately Owned Businesses: Many Yukon-based businesses are already taking action to respond to climate change. Home appliance retailers and heating and building contractors, for example, provide products and technologies that promote energy conservation. Resource-based activities are also affected, since they are both major energy consumers and are looking for ways to conserve energy.

Public: Many individual Yukoners have made a conscious decision to reduce their contribution to climate change and adapt as necessary. One way is to improve energy conservation and efficiency in their homes, which results in cost savings as well as reduced GHG emissions.

Universities and Research Institutes: Many universities and research organizations based outside of Yukon are actively engaged in research projects related to climate change here. These organizations contribute expertise, knowledge and funding to climate change initiatives in Yukon. They often collaborate with local researchers, organizations and communities in their work.

Yukon College: Yukon College, through the Northern Research Institute and the Northern Climate Exchange, undertakes research and action projects on northern climate change and provides related support, information outreach and education.

Yukon First Nations: Yukon First Nations are involved in delivering a variety of programs to their citizens, and are committed to addressing climate change through the use of traditional knowledge and other means.

Yukon Municipalities: Municipal governments are engaged in developing and implementing Integrated Community Sustainability Plans. These plans address issues such as community energy systems, public transit, waste disposal and energy efficiency. Municipalities are also responsible for land planning, municipal infrastructure and services within their municipalities.

Migrating Tundra and Trumpeter swans rest and feed at M'Clintock Bay each spring on their way to their northern nesting grounds. This is one of the few ice-free waterbodies in the region in April, making it a critical stopover but one that is very dependent on local weather conditions.

APPENDIX 4: GLOSSARY

Adaptation – Taking actions that can prevent or reduce the negative impacts of climate change and/or build on the positive impacts. Adaptation means managing risks in a way that makes infrastructure, buildings, economic and social activities, and the natural environment more resilient to change. Adaptation provides a way to ensure safer, more sustainable and self-sufficient communities.

Carbon Capture and Storage – A mitigation approach to reducing GHG emissions. It is based on capturing carbon dioxide (CO_2) and storing it, e.g. capturing CO_2 emissions from power plants and injecting it deep into the ground.

Carbon Dioxide (CO_2) – A heavy colourless gas formed by the burning of fossil fuels such as coal, oil and natural gas. It is also formed in animal respiration and in the decay or combustion of animal or vegetable matter. CO_2 is absorbed from the air by plants through photosynthesis. The IPCC recognizes CO_2 as the principal contributor to increasing atmospheric levels of GHGs.

Carbon Neutral – Means maintaining an equal balance between producing and using carbon. For example, the production of carbon-dioxide emissions can be off-set, or made neutral, by undertaking carbon-reducing activities such as planting trees in urban areas or buying carbon offsets from a wind energy company.

Carbon Offsets – An emission-reduction credit from another organization's project that results in less carbon dioxide or other GHGs in the atmosphere than would otherwise occur. Carbon offsets are typically measured in tons of CO_2-equivalents (or ' CO_2eq') and are usually bought and sold through a number of international brokers, online retailers, and trading platforms.

Climate – The average weather for a particular region and time period.

Climate Change – A change in the average weather that a given region experiences. Climate change on a global scale includes changes to temperature, shifts in wind patterns, and changes to precipitation.

CO_2 – Carbon Dioxide.

Fossil Fuels – Fuels containing carbon, the most common being coal, oil and gasoline. These fuels were formed over millions of years through the decay, burial and compaction of rotting vegetation and marine organisms. Fossil fuel combustion is the major contributor to human-generated GHGs in the atmosphere, according to the IPCC.

APPENDIX 4 CONTINUED...

GHGs – Greenhouse gases.

Global Warming – The overall trend to a warmer climate for the planet. According to the IPCC, the Earth's atmosphere has warmed up by about 0.74°C in the last 100 years. Most climate change scientists think increased GHG emissions during this period led to an enhanced greenhouse effect which has in turn led to global warming.

Greenhouse Effect – Greenhouse gases allow incoming solar energy to pass through the Earth's atmosphere but prevent most of the heat radiating from the Earth's surface and lower atmosphere from escaping into outer space – similar to how a glass greenhouse works. The greenhouse effect is necessary to maintain life on earth because it helps keep the Earth 33°C warmer than it would be without the presence of an atmosphere. The presence of more GHGs allows the atmosphere to trap more heat. This is sometimes called the enhanced greenhouse effect.

Salmon spawning.

Greenhouse Gases (GHGs) – Includes water vapour, carbon dioxide, methane and nitrous oxide.

Greenhouse Gas Emissions – The release of substances that can be transformed into greenhouse gases and/or the direct release of greenhouse gases into the atmosphere.

Intergovernmental Panel on Climate Change (IPCC) – The scientific body established to collect and synthesize the world's best research on climate change. Their work on the *Fourth Assessment Report (2007)* recently won the Nobel Prize. All reports, including the *Summary for Policymakers*, can be found online: **www.ipcc.ch**.

Mitigation – Measures that seek to avoid, reduce or delay global warming by reducing GHG emissions. For example, switching to renewable energy sources from gas and oil is one way to mitigate.

Permafrost – The layer of permanently frozen ground that underlies more than half of Yukon. Permafrost exists wherever ground temperatures remain at or below 0 degrees Celsius throughout the year.

Renewable Energy – Energy that comes from sources renewed on an ongoing basis through natural processes. Examples include the sun, wind, wood, flowing water, or relatively warm ground, air or water temperatures.

Weather – The specific condition of the atmosphere at a particular place and time, determined by measuring temperature, wind speed and direction, humidity, atmospheric pressure, cloudiness and precipitation.

APPENDIX 5: RESOURCES

DOCUMENTS

The following climate change related documents are available on the Environment Yukon website (**www.environmentyukon.gov.yk.ca**):

- Government of Yukon Climate Change Strategy (2006)
- A Snapshot: Yukon Government Actions on Climate Change during 2006 & 2007
- Scoping the Government of Yukon Climate Change Action Plan: Workshop Report (November 2007)
- Yukon Youth Outside (the box) Final Report (December 2007)
- 'What We Heard' summary of comments on the draft Yukon Government Climate Change Action Plan
- Draft Yukon Government Climate Change Action Plan (May 2008)

PROGRAMS

Energy Solutions Centre
206A Lowe St. (Box 2703)
Whitehorse, Yukon
Y1A 2C6

Phone: 867.393.7063
Fax: 867.393.7061
Toll free (In Yukon): 1.800.661.0408, ext. 7063
esc@gov.yk.ca

Sample programs: Good Energy Rebates, Energy Solutions Business Directory, Storefront and Outreach, Public Buildings Energy Tracking System

Yukon Housing Corporation
410H Jarvis Street
Whitehorse, Yukon
Y1A 2H5

Phone: 867.667.5759
Fax: 867.667.3664
Toll free (In Yukon): 1.800.661.0408, ext. 5759
ykhouse@gov.yk.ca

Sample Programs: Residential Energy Programming, Green Mortgage, R-2000 Builder Updates and Workshops, EnerGuide Evaluator Training, ecoENERGY Retrofit

APPENDIX 6: 50 WAYS TO REDUCE YOUR EMISSIONS

*Revised with permission from LiveSmart BC (**www.LiveSmartBC.ca**)*

1 Upgrade the insulation in your house.

2 Reduce air leakage by caulking around vents and window and door frames, sills, joints and around any objects that penetrate exterior walls.

3 Plug gaps around pipes, ducts, fans and vents that go through walls, ceilings and floors from heated to unheated spaces.

4 Install weather-stripping where needed on windows, doors, and interior attic hatches.

5 Apply shrink-film to windows and glass doors.

6 Move furniture, rugs, and drapes away from air grills and heating vents so that heat can circulate efficiently throughout the home.

7 Install energy-efficient windows and doors.

8 Close the damper in your wood-burning fireplace when it is not in use, and ensure that the damper fits properly, so heat does not escape out the chimney.

9 Turn down the heat in your home by two degrees in the winter.

10 Turn down the heat by three to five degrees Celsius at night and while on vacation.

11 Turn off the heat in your garage, and turn it on only prior to using it.

12 Install an EnergyStar programmable thermostat.

13 Use your microwave or an electric heating element instead of a gas element when heating food.

14 Buy a high-efficiency furnace with a variable speed motor, such as one certified by EnergyStar.

15 Get your furnace maintained annually.

16 Wrap your water heater in an insulation blanket.

17 Set your water heater to 49 degrees Celsius.

18 Install a solar water heating system to heat your water.

19 Wash your dishes in cold water when possible.

20 Wash your clothes in cold water.

21 Install low-flow shower heads and faucets.

22 Take shorter showers.

23 Use a front-loading washing machine, which saves water.

24 Hang your laundry to dry instead of using a clothes dryer.

25 Compost organic waste at home in your garden or with a worm composter if you live in an apartment.

26 Use a rake or an electric leaf blower instead of a gas-powered one.

27 If planting trees near your house, plant deciduous trees to the south of your house.

28 "Grasscycle" – leave grass clippings on your lawn or bag them and put them out for compost collection.

29 Use your own mulch or compost on your garden instead of buying fertilizing products.

30 Walk, cycle or inline skate to work one day a week.

31 Replace incandescent light bulbs with compact fluorescents.

32 Buy an electric bicycle or scooter instead of a car. This reduces vehicle emissions.

33 Take transit to work one day a week (or carpool).

34 Join a car sharing co-operative instead of owning a car.

35 Walk or cycle with your children to school, instead of driving. This reduces vehicle emissions.

36 If driving, do many short-distance errands at once so your engine stays warm.

37 Purchase vehicle fuel mixed with renewable ethanol, when and where it is available.

38 Drive below 90km/hr.

39 While driving, drive moderately and accelerate slowly.

40 Maintain proper tire inflation for your car; check your tires weekly.

41 Schedule regular maintenance checks for your car.

42 Turn off your car instead of idling for periods longer than 10 seconds.

43 Use a reusable bag for shopping.

44 Buy products that are recyclable.

45 Buy products that have recyclable packaging.

46 Buy products that are reusable.

47 Buy good-quality, long-lasting products that you will not have to replace so soon.

48 Recycle as much waste as possible.

49 Use rechargeable batteries where possible.

50 Plant a tree.

Tree seedlings.

TABLED DOCUMENT 211-18(3) TABLED ON JUNE 1, 2018

Government of Northwest Territories
Gouvernement des Territoires du Nord-Ouest

2030 NWT CLIMATE CHANGE STRATEGIC FRAMEWORK

CADRE STRATÉGIQUE SUR LE CHANGEMENT CLIMATIQUE DES TNO 2030

Le present document contient la traduction française du résumé et le message du ministre

Table of Contents

Message from the Premier 4

Message from the Minister 5

Executive Summary 6

Message du Premier Ministre 10

Message du Ministre 11

Résumé 12

1.0 INTRODUCTION – CLIMATE CHANGE 16

1.1 International and National Context 17

1.2 NWT Greenhouse Gas Emissions 17

1.3 Understanding Climate Change 19

1.4 Why We Need a NWT Climate Change Strategic Framework 21

1.5 Linkages with Other Plans and Strategies 22

2.0 2030 NWT CLIMATE CHANGE STRATEGIC FRAMEWORK 24

2.1 What We Heard 25

2.2 Vision, Guiding Principles and Goals 26

2.3 2030 Milestone 27

Table of Contents

3.0 GOAL #1 – TRANSITION TO A LOWER CARBON ECONOMY **28**

3.1 NWT Annual Greenhouse Gas Emission Targets **29**

3.2 NWT Sector-specific Greenhouse Gas Emissions **30**

3.3 NWT Greenhouse Gas Emission Reduction Efforts **30**

3.4 Emissions Tracking and Reporting **34**

3.5 Goal #1 – Priorities to be Included in the Action Plan **35**

4.0 GOAL #2 – IMPROVE KNOWLEDGE OF CLIMATE CHANGE IMPACTS **36**

4.1 Climate Change Knowledge **37**

4.2 Climate Change Impacts, Knowledge Gaps and Research and Monitoring Requirements **38**

4.3 Goal #2 – Action Plan Research and Monitoring Requirements **46**

5.0 GOAL #3 – BUILD RESILIENCE AND ADAPT TO A CHANGING CLIMATE **47**

5.1 Sustainability of Ecosystems **48**

5.2 Natural Environment **48**

5.3 Human Health, Public Safety, and Culture and Heritage **49**

5.4 Infrastructure **51**

5.5 Community Adaptation Planning **53**

5.6 Cost of Inaction **53**

5.7 Goal #3 – Summary of Efforts Required to Build Resilience and Adapt to a Changing Climate **54**

Table of Contents

6.0 PUBLIC AWARENESS, CAPACITY BUILDING AND COMMUNITY INVOLVEMENT 55

6.1 Communication and Outreach **56**

6.2 Community Involvement and Capacity-Building **56**

6.3 Action Plan Priorities **57**

7.0 ECONOMIC DEVELOPMENT OPPORTUNITIES 58

8.0 IMPLEMENTATION 60

8.1 Shared Responsibility and Partnership **61**

8.2 2019-2023 Action Plan and Framework Renewal **61**

8.3 Governance and Coordination **62**

8.4 Financial and Resources **63**

8.5 Tracking and Reporting **63**

9.0 LOOKING FORWARD 64

APPENDIX A: Department of Environment and Natural Resources and Department of Infrastructure Responses to the Auditor General of Canada Report – Climate Change in the Northwest Territories **66**

APPENDIX B: Climate Change Impacts, Knowledge Gaps and Research and Monitoring Requirements **73**

APPENDIX C: Sustainability of Ecosystems as a Response to Climate Change **91**

APPENDIX D: Current and Potential Adaptation Efforts to Address Climate Change Impacts **93**

Message from the Premier

Climate change represents serious environmental, economic and social challenges for the Northwest Territories (NWT). During 2016-2017 the Government of the Northwest Territories (GNWT) engaged with community and Indigenous governments, stakeholders and NWT residents to discuss energy and climate change issues.

NWT residents told us that they have strong interest in solutions that support the transition to a lower carbon economy. However they are also concerned about how this will impact the high cost of living and doing business in the NWT. They are very interested in energy efficiency and developing renewable energy options and we heard that we need to set realistic and achievable emission targets to address climate change. There was a varied view on carbon pricing but general support existed for some carbon revenues to be allocated to improving energy efficiency and renewable energy solutions in communities.

People expressed their concerns about the impacts of climate change, including changing ice conditions and increased risks to human safety, impacts on water quality and quantity, impacts on forest, habitat and wildlife, invasive species, food security and decreased access to country foods, and loss of culturally significant sites and artifacts.

We heard the need for increased research and monitoring, with traditional knowledge highlighted as an important tool in understanding and adapting to climate change. Community and Indigenous governments indicated that they want to be more involved in identifying, planning and undertaking research and monitoring of climate change impacts. We heard that there needs to be better sharing of information and research results with community and Indigenous governments, residents and stakeholders.

The 2030 NWT Climate Change Strategic Framework and 2030 Energy Strategy reflect the priorities of the 18th Legislative Assembly. The GNWT supports the use of energy efficient technologies, increasing the production and transmission of renewable and alternative energy, and the implementation of this strategy to mitigate and adapt to climate change in collaboration with other governments and organizations.

This Framework provides the territory with a strong direction between now and 2030 to act locally, while fulfilling our commitments to Canada and the world. We will continue to work to support the implementation of the Pan-Canadian Framework on Clean Growth and Climate Change, the Canadian Energy Strategy and the development of the Northern Adaptation Strategy. The actions in these initiatives contribute to Canada's commitment as signatory to the Paris Agreement.

Implementing the 2030 NWT Climate Change Strategic Framework means rolling up our sleeves and putting our words into action. Working together we can transition to a lower carbon economy, build a sustainable energy system and strengthen our understanding of the effects of climate change, while implementing solutions that increase our resiliency and ability to adapt to climate change now and for future generations.

The Honourable Bob McLeod

Premier of the Northwest Territories

Message from the Minister

The 2030 NWT Climate Change Strategic Framework provides the path to address the challenges of climate change to 2030. The vast geography and remote locations of our communities and industry present challenges for responding to climate change in the NWT. Parts of the territory are warming up to four times faster than global averages, and considerable changes to the natural environment are being experienced by Northerners.

Canada is committed to a 30% reduction in annual greenhouse gas emissions by 2030, and the GNWT has also set this goal for the territory. We must ensure that the economy remains strong and viable while taking concrete actions to transition to a lower carbon economy. We will continue to build on our valuable experience, knowledge and past investments in this area, such as those in energy efficiency and local renewable energy systems, to support this transition. The Framework is directly linked to the 2030 Energy Strategy, which is the primary mechanism that government will be using to reduce greenhouse gas emissions.

As the northern climate continues to change, plans and operations will need to be adjusted to deal with a range of possible future conditions and unanticipated events. Resiliency and adaptation are two interrelated responses to address the various impacts of climate change on individuals, community and Indigenous governments, ecosystems, infrastructure, industry and the economy.

It is understood that climate-related changes create impacts at the local and regional levels. We will continue to work with community and Indigenous governments, and stakeholders to improve research and monitoring, connect them to various funding programs, and build local capacity to support the implementation of the Framework.

I look forward to working with community and Indigenous governments, stakeholders including industry, non-government organizations and others to move towards establishing a lower carbon economy, increasing our knowledge of climate impacts, and building our resiliency while adapting to a changing climate. By working together, we can support a sustainable future for the NWT.

The Honourable Robert C. McLeod

Minister of Environment and Natural Resources

1441

Executive Summary

The residents of the Northwest Territories (NWT), particularly Indigenous people, have a long-standing relationship with the natural environment. Many are concerned about the effects of climate change as the severity of environmental impacts increases, with temperatures warming faster in the North compared to the global average. Such effects include greater coastal erosion, more permafrost thawing, longer ice-free seasons, increasing prevalence of wildland fires and new mammal, bird, insect and fish species moving northward. These effects can have serious implications for the health and safety of residents, culture and heritage, infrastructure and the viability of certain economic activities. Therefore, taking strong action to address climate change in the NWT is imperative.

Recognizing that climate change represents serious and urgent challenges for the NWT, the Priorities of the 18th Legislative Assembly and the Mandate of the Government of the Northwest Territories (GNWT) 2016-2019 reflect the commitment to take action on climate change, beginning with the development of the 2030 NWT Climate Change Strategic Framework (the Framework). The Framework outlines how the territory plans to respond to challenges and opportunities associated with a changing climate, moving towards an economy that is less dependent on fossil fuels and doing its part to contribute to national and international efforts to address climate change. The Framework was developed at the same time as the 2030 Energy Strategy. The two documents are closely linked and contribute, along with the GNWT's commitment to implementing carbon pricing, to the Pan-Canadian Framework on Clean Growth and Climate Change, which supports Canada in meeting its international commitments to reduce greenhouse gas emissions.

Engagement on the development of the Framework and 2030 Energy Strategy took place during the fall and winter of 2016 and 2017 and included six regional workshops, a public survey and the opportunity to provide written submissions. From December 2017 to January 2018, the draft Framework was released for public review. Throughout the development and review process, valuable input was received from community and Indigenous governments, territorial and federal departments, resource management boards, non-government organizations, academic institutions, industry and the general public, which advanced the Framework's vision, principles and goals.

The vision of the Framework – which states that by 2030, the NWT will enjoy a strong, healthy economy that is less dependent on fossil fuels and will have developed the knowledge, tools and measures needed to increase resilience and adapt to the changing northern climate – rests on several key principles. These principles center on: respecting Aboriginal and Treaty rights; including climate change considerations in planning, decision-making and operational activities; sharing responsibility for taking action on climate change; strengthening collaboration between residents and community, Indigenous, territorial and federal governments; and, recognizing the importance of traditional, local and scientific knowledge in understanding climate impacts and adaptation measures.

To achieve its vision, the NWT is focusing on ***three goals***:

- *Goal #1:* Transition to a strong, healthy economy that uses less fossil fuel, thereby reducing greenhouse gas emissions by 30% below 2005 levels by 2030;
- *Goal #2:* Improve knowledge of the climate change impacts occurring in the NWT; and
- *Goal #3:* Build resilience and adapt to a changing climate.

GOAL #1

The focus of the Framework's first goal is transitioning to a lower carbon economy that uses less fossil fuel. To reach this goal, the NWT needs to reduce its annual greenhouse gas emissions to 1,094 kilotonnes (kt) carbon dioxide equivalents (CO_2e) (from a 2005 level of 1,563 kt CO_2e).

Electricity generation, space heating, transportation and industry are the main sectors for fossil fuel use and greenhouse gas emissions tracked in the NWT. The actions needed to achieve Goal #1 are outlined in the 2030 Energy Strategy, which serves as the mechanism for reducing greenhouse gas emissions related to energy supply and consumption. The focus of the 2030 Energy Strategy is on mitigation of emissions, whereas the Framework focuses on tracking and reporting progress on mitigation, and building resilience and adapting to a changing climate.

GOAL #2

Improving knowledge of climate change impacts occurring in the NWT is the second goal of the Framework. To address climate change, there is a need for greater understanding of the impacts to the natural environment, residents' health, safety, culture and heritage, and the territory's infrastructure. The integrated use and management of traditional, local and scientific knowledge to determine knowledge gaps, set and implement research and monitoring requirements, and obtain current and timely information, is essential.

The warming climate is leading to gradual shifts within ecosystems and more extreme events affecting the natural environment. Thawing of permafrost, changes to water quality and quantity, altered forests and tundra vegetation, and impacts on wildlife, fish and marine mammal health and distribution, have been observed for several years and are intensifying.

The effects of climate change on the natural environment can directly impact the health of NWT residents, both physically (such as increases in respiratory problems due to extreme weather) and mentally (such as stress or effects on well-being due to impacts on traditional harvesting sites and activities).

Safety of the general public is also a central concern, from erosion of coastlines leading to building instability, to increased flood risks in certain communities, to less predictable winter travel conditions, all leading to a heightened risk of injury and death.

Effects on the territory's culture and heritage, from risks to heritage resources such as archeological sites due to permafrost thaw and wildland fires, to impacts on traditional economies such as trapping, are evident and will likely continue to intensify. Indigenous people and other residents of the NWT are particularly vulnerable to climate related changes since, for generations, they have depended on the land, water and wildlife for their livelihood and sustenance.

The NWT's infrastructure (buildings, roads, pipelines, transmission lines, etc.) has been and continues to be impacted by climate change. Permafrost thaw and extreme weather events can have significant effects on infrastructure. Coastal erosion is also a concern in the northern parts of the NWT, threatening important infrastructure such as roads and buildings.

Developing a better understanding of current and future impacts and opportunities will support informed decision-making on how to build resilience and adapt to a changing climate.

1443

Executive Summary

GOAL #3

Building resilience and adapting to a changing climate is the Framework's third goal. Building resilience focuses on finding ways to withstand the changes that are occurring. For changes that are unavoidable, adaptation efforts are required to find new ways of doing things, such as adjusting plans and operational activities.

Community and Indigenous governments want and need to be involved in adaptation planning to ensure ecosystems, including the people who live in them, remain healthy and diverse. Potential actions to adapt to the impacts of climate change on the natural environment include: increasing capacity at all levels of government (community, Indigenous and territorial governments) to undertake climate change adaptation actions; fostering science-based decision-making tools to assist project planning or development in permafrost regions; using increasingly available satellite imagery and technology to support flood forecasting; and, considering the harvesting of new non-indigenous species to sustain commercial and subsistence harvests of fish, wildlife and plants.

Potential actions to adapt to the impacts of climate change on human health, public safety, and culture and heritage include: ensuring health facilities and services are able to withstand climate risks, particularly during extreme weather events; assessing and planning for climate change-related hazards in community emergency plans; and strengthening communities from a social and cultural aspect to help build resiliency. This can occur through the documentation and use of traditional and local knowledge and the involvement of youth and elders in on-the-land programming to ensure knowledge is passed on to future generations.

Potential actions to ensure systems for transportation, power and communication, water and sanitation, and other important infrastructure like health centres, schools and community facilities are adapted to a changing climate include: improving and implementing building standards to take thawing permafrost conditions and extreme weather events into consideration during planning, design, construction and operations; and monitoring and updating risk assessments to understand when it is necessary to mitigate or upgrade some existing infrastructure (like buildings and roads) to handle changing climate conditions not considered when initially designed and constructed.

A warming climate may also provide new opportunities in sectors such as agriculture and forestry. As growing seasons lengthen, producing more food locally could help to address food security concerns, while continuing to increase local biomass use (cordwood and pellets) could provide local solutions and employment in the NWT. Both industries support the reduction of greenhouse gas emissions.

MOVING FORWARD

For each of the Framework's three goals, potential actions to be included in the 2019-2023 Action Plan have been summarized. Requirements for communicating climate change information and building capacity in communities to address impacts have also been outlined. Communicating information, sharing results broadly and involving communities in all aspects of improving knowledge is imperative.

The potential actions identified will serve as the basis for developing and subsequently implementing the 2019-2023 Action Plan. As it is being implemented, annual reports will be produced to track progress and adjust actions as required. The 2019-2023 Action Plan will be reviewed and evaluated after five years, when a second Action Plan (2025-2029) will be developed and implemented.

As reflected in the Framework, significant steps have been taken to address recommendations made by the Office of the Auditor General of Canada in its October 2017 report on climate change in the NWT. The detailed Action Plan that is being developed to implement the Framework will further address specific Auditor General recommendations.

Shared responsibility and partnerships with community and Indigenous governments and stakeholders will be critical for the successful implementation of the Action Plan. The GNWT's Department of Environment and Natural Resources, as the lead department responsible for climate change, will provide strong leadership on related coordination and communication within the NWT and with other provinces, territories and the federal government.

Through implementation of the Framework, the NWT can respond to the challenges and opportunities associated with climate change, move towards a lower-carbon economy and do its part to contribute to national and international efforts on climate change.

Message du Premier Ministre

Les changements climatiques posent de sérieux défis environnementaux, économiques et sociaux aux Territoires du Nord-Ouest (TNO). En 2016-2017, le gouvernement des Territoires du Nord-Ouest (GTNO) a donc mené des consultations sous le thème de l'énergie et des changements climatiques auprès des administrations communautaires, des gouvernements autochtones, des résidents et d'autres parties concernées.

Les Ténois ont manifesté un vif intérêt pour les solutions qui faciliteraient le passage à une économie plus sobre en carbone. Néanmoins, ils craignent qu'elles n'élèvent encore plus le coût de la vie et des affaires aux TNO. S'ils ont à cœur l'efficacité énergétique et le développement des énergies renouvelables, ils ont aussi fait valoir la nécessité d'établir des cibles réalistes de réduction des émissions. Quant à la tarification du carbone, les opinions divergent, mais les Ténois souscrivent généralement à l'idée d'affecter une partie des recettes ainsi générées à l'amélioration de l'efficacité énergétique et des énergies renouvelables dans les collectivités.

Les intervenants se disent inquiets des effets des changements climatiques, notamment la détérioration de l'état des glaces, l'augmentation des risques pour la population, les répercussions sur les quantités d'eau et sa qualité, ainsi que sur les forêts, les habitats naturels, la faune, les espèces envahissantes et la sécurité alimentaire, la réduction de l'accès aux aliments traditionnels et la perte de sites et d'artéfacts à forte valeur culturelle.

Les Ténois ont souligné qu'il fallait intensifier la recherche et la surveillance, et que le savoir traditionnel nous aiderait grandement à comprendre les changements climatiques et à nous y adapter. Les administrations communautaires et les gouvernements autochtones veulent aussi participer davantage aux travaux entrepris pour connaître, prévoir, étudier et surveiller les effets des changements climatiques. De surcroît, il faudrait mieux communiquer l'information et les résultats des études aux administrations communautaires, aux gouvernements autochtones, aux résidents et aux autres parties concernées.

Le Cadre stratégique sur le changement climatique des TNO pour 2030 et la Stratégie énergétique 2030 reflètent les priorités de la 18e Assemblée législative. Le GTNO préconise d'utiliser des technologies écoénergétiques, d'accroître la production et le transport d'énergies renouvelables et de remplacement, et de recourir à cette stratégie pour atténuer les effets des changements climatiques et s'y adapter, en collaboration avec d'autres gouvernements et organisations.

Le Cadre donne une orientation claire à l'action que le territoire mènera d'ici 2030 tout en respectant ses engagements nationaux et internationaux. Nous continuerons d'œuvrer à l'exécution du Cadre pancanadien sur la croissance propre et les changements climatiques et de la Stratégie canadienne de l'énergie, et à l'élaboration de la stratégie d'adaptation pour le Nord. Ce travail aide d'ailleurs le Canada à honorer l'engagement pris à la signature de l'Accord de Paris.

Le Cadre stratégique sur le changement climatique des TNO pour 2030 nous demande de retrousser nos manches et de passer de la parole aux actes. Tous ensemble, nous pouvons nous doter d'une économie plus sobre en carbone, bâtir un réseau électrique durable et mieux comprendre les effets des changements climatiques, tout en misant sur des solutions qui amélioreront notre résilience et notre capacité d'adaptation, pour les générations d'aujourd'hui et de demain.

L'honorable Bob McLeod

Premier ministre des Territoires du Nord-Ouest

Message du Ministre

Le Cadre stratégique sur le changement climatique des TNO pour 2030 montre la voie à suivre pour relever les enjeux liés aux changements climatiques d'ici 2030. En raison de l'immensité du territoire et de l'éloignement des entreprises et des collectivités, la lutte contre les changements climatiques aux TNO est particulièrement complexe. Dans certaines régions, la vitesse du réchauffement est quatre fois plus élevée que les moyennes mondiales; de surcroît, les Ténois assistent à une transformation radicale de leurs milieux naturels.

Le Canada s'est engagé à réduire de 30 % ses émissions annuelles de gaz à effet de serre d'ici 2030, objectif que s'est aussi fixé le GTNO pour le territoire. Nous devons assurer la vigueur et la viabilité de notre économie tout en prenant des mesures concrètes pour passer à une économie plus sobre en carbone. Afin d'opérer cette transition, nous continuerons de miser sur notre précieuse expérience, nos connaissances et nos investissements passés dans le secteur, par exemple en matière d'efficacité énergétique et de filières d'énergies renouvelables locales. Le Cadre est directement lié à la Stratégie énergétique 2030, principal outil qu'emploiera le gouvernement pour réduire les émissions de gaz à effet de serre.

Vu l'évolution constante du climat nordique, il faudra adapter les plans et les activités à un large éventail de conditions et d'imprévus potentiels. C'est par la résilience et l'adaptation, deux modes d'intervention interreliés, que nous ferons face aux divers effets des changements climatiques sur la population, les administrations communautaires, les gouvernements autochtones, les écosystèmes, les infrastructures, les entreprises et l'économie.

Il va sans dire que les effets des changements climatiques sont ressentis à l'échelle locale et régionale. Nous continuerons donc de collaborer avec les administrations communautaires, les gouvernements autochtones et les autres parties concernées pour leur permettre d'accéder à divers programmes de financement, améliorer la recherche et la surveillance, et accroître les ressources locales liées à l'exécution du Cadre.

Je me réjouis à l'idée de travailler avec les administrations communautaires, les gouvernements autochtones et les autres parties concernées, comme les entreprises et les organisations non gouvernementales, pour que nous puissions passer à une économie plus sobre en carbone, mieux comprendre les effets des changements climatiques et développer notre résilience tout en nous adaptant à cette évolution du climat. Ensemble, nous pouvons assurer aux TNO un avenir durable.

L'honorable Robert C. McLeod

Ministre de l'Environnement et des ressources naturelles

Résumé

Les résidents des Territoires du Nord-Ouest (TNO), particulièrement les peuples autochtones, sont attachés depuis très longtemps aux milieux naturels. Bon nombre d'entre eux se préoccupent des effets des changements climatiques, de plus en plus dommageables pour l'environnement, d'autant plus que les températures augmentent plus rapidement dans le Nord qu'ailleurs en moyenne dans le monde. Les changements climatiques entraînent l'accélération de l'érosion côtière et de la fonte du pergélisol, le prolongement de la période sans glace, l'augmentation du risque de feux de forêt et la migration vers le nord de nouvelles espèces de mammifères, d'oiseaux, d'insectes et de poissons. Ces phénomènes risquent d'avoir de graves conséquences sur la santé et la sécurité de la population, de même que sur la culture, le patrimoine, les infrastructures, et la viabilité de certaines activités économiques. Il est donc primordial de lutter vigoureusement contre les changements climatiques aux TNO.

Les changements climatiques engendrent des problèmes aussi graves qu'urgents aux TNO. Ainsi, les priorités de la 18e Assemblée législative et le mandat 2016-2019 du gouvernement des Territoires du Nord-Ouest (GTNO) dénotent-ils une volonté de passer à l'action, avec comme première étape la création du Cadre stratégique sur le changement climatique des TNO pour 2030 (le Cadre). Le Cadre définit comment le territoire entend relever les défis inhérents à l'évolution du climat et en exploiter les potentialités pour développer une économie moins tributaire des combustibles fossiles qui contribue aux efforts nationaux et internationaux de lutte contre les changements climatiques. Il a été élaboré en même temps que la Stratégie énergétique 2030; les deux documents sont étroitement liés et s'inscrivent, tout comme l'intention du GTNO d'imposer une tarification du carbone, dans le Cadre pancanadien sur la croissance propre et les changements climatiques, qui aide le Canada à respecter ses engagements internationaux en matière de réduction des émissions de gaz à effet de serre.

Des consultations sur le Cadre et la Stratégie énergétique 2030 ont eu lieu à l'automne 2016 et à l'hiver 2017; parmi les initiatives alors menées, notons six ateliers régionaux, un sondage auprès de la population et un appel de commentaires écrits. De décembre 2017 à janvier 2018, le public a pu prendre connaissance de la version préliminaire du Cadre. Tout au long du processus d'élaboration et d'évaluation, diverses parties – administrations communautaires, gouvernements autochtones, ministères territoriaux et fédéraux, offices de gestion des ressources, organismes non gouvernementaux, établissements d'enseignement, entreprises, grand public – ont soumis des observations fort utiles qui ont fait progresser la vision, les principes et les objectifs du Cadre.

La vision est que d'ici 2030, les TNO auront une économie saine, forte et moins tributaire des combustibles fossiles, et disposeront du savoir, des outils et des mesures nécessaires pour accroître leur résilience et s'adapter aux changements du climat nordique. Elle s'articule autour de plusieurs grands principes : respecter les droits ancestraux et les droits issus de traités; tenir compte des changements climatiques dans la planification, les décisions et les activités opérationnelles; partager la responsabilité de la lutte contre les changements climatiques; renforcer la collaboration entre les résidents et les administrations communautaires et gouvernements autochtones, territorial et fédéral; et reconnaître l'importance de mobiliser le savoir traditionnel, local et scientifique pour comprendre les effets des changements climatiques et s'y adapter.

Pour concrétiser cette vision, les TNO s'emploient à atteindre ***trois objectifs*** :

- ***Objectif 1 :*** Se doter d'une économie saine et forte, où l'utilisation des combustibles fossiles sera diminuée de sorte à réduire l'émission de gaz à effet de serre de 30 % d'ici 2030 (par rapport à 2005);
- ***Objectif 2 :*** Mieux comprendre les effets des changements climatiques aux TNO;
- ***Objectif 3 :*** Favoriser la résilience et l'adaptation aux changements climatiques.

OBJECTIF 1

Le premier objectif est, essentiellement, de développer une économie plus sobre en carbone qui utilise moins de combustibles fossiles. Pour parvenir à une réduction de 30 % d'ici 2030, les TNO doivent ramener à 1 094 kilotonnes (kt) d'équivalent dioxyde de carbone (éq. CO_2) leurs émissions annuelles de gaz à effet de serre, qui se chiffraient à 1 563 kt d'éq. CO_2 en 2005.

C'est surtout dans la production d'électricité, le chauffage local, les transports et le secteur industriel que les TNO surveillent l'utilisation des combustibles fossiles et les émissions de gaz à effet de serre. Bon nombre de mesures associées à l'objectif 1 sont décrites dans la Stratégie énergétique 2030, pierre angulaire de la réduction des émissions de gaz à effet de serre attribuables à la production et à la consommation d'énergie. Si cette stratégie vise à réduire les émissions, le Cadre concerne davantage le suivi et la communication des progrès réalisés, la résilience et l'adaptation.

OBJECTIF 2

Le deuxième objectif du Cadre est de mieux comprendre les effets des changements climatiques aux TNO. De fait, pour lutter contre ces changements, il faut d'abord en comprendre les effets sur les milieux naturels, la santé et la sécurité de la population, la culture et le patrimoine ténois, et les infrastructures du territoire. Par ailleurs, il est essentiel de mobiliser et de maîtriser le savoir traditionnel, local et scientifique pour en relever les lacunes, définir les besoins en recherche et en surveillance et agir en conséquence, et obtenir des informations récentes en temps utile.

Le réchauffement climatique entraîne une mutation des écosystèmes et une multiplication des événements extrêmes altérant les milieux naturels. C'est ainsi qu'on observe depuis plusieurs années des phénomènes qui ne cessent de s'intensifier : fonte du pergélisol, fluctuations des quantités d'eau et de sa qualité, transformation des forêts et de la toundra, et effets sur la santé et la chorologie de la faune, dont les poissons et les mammifères marins.

Les effets des changements climatiques sur les milieux naturels peuvent influer directement sur la santé des Ténois, sur le plan tant physique (ex. : multiplication des troubles respiratoires en raison des températures extrêmes) que psychologique (ex. : stress ou dégradation du bien-être en raison des effets sur les sites et activités de récolte traditionnelle).

La sécurité du public est aussi une priorité. Bâtiments fragilisés par l'érosion des côtes, inondations plus probables dans certaines collectivités, conditions de déplacement hivernales moins prévisibles : ces phénomènes augmentent tous les risques de blessure et de décès.

Les effets des changements climatiques sur la culture et le patrimoine des TNO sont manifestes et devraient continuer de s'aggraver. Mentionnons notamment la dégradation des ressources patrimoniales, comme les sites archéologiques, causée par la fonte du pergélisol et les feux de friches, et les répercussions sur les activités économiques traditionnelles telles que le piégeage. Les peuples autochtones et d'autres résidents sont particulièrement vulnérables, puisque ce sont les terres, l'eau et la faune qui assurent leur subsistance depuis des générations.

Les infrastructures des TNO (bâtiments, routes, pipelines, lignes de transport, etc.) subissent également les contrecoups des changements climatiques. Elles peuvent être durement touchées par la fonte du pergélisol et les phénomènes météorologiques extrêmes. Dans le nord du territoire, l'érosion des côtes est aussi source d'inquiétude, mettant en péril d'importantes infrastructures comme les routes et les bâtiments.

Pour prendre des décisions éclairées sur les moyens de favoriser la résilience et l'adaptation, il faudra mieux comprendre les potentialités et effets actuels et futurs des changements climatiques.

Résumé

OBJECTIF 3

Le troisième objectif du Cadre est de favoriser la résilience et l'adaptation aux changements climatiques. Sous l'angle de la résilience, il s'agit de savoir comment faire face aux transformations qui s'opèrent. Dans les cas où l'on ne peut y échapper, il faut alors adapter les façons de faire, comme les plans et les activités opérationnelles.

Les administrations communautaires et les gouvernements autochtones veulent et doivent prendre part à ces efforts d'adaptation pour que les écosystèmes, y compris les populations qui y vivent, demeurent sains et diversifiés. Du côté des milieux naturels, cette adaptation peut prendre diverses formes : accroître, à tous les ordres de gouvernement (administrations communautaires, gouvernements autochtones et territorial), les ressources consacrées à cette mission; recourir à des outils décisionnels scientifiques pour planifier ou mener des projets dans les zones de pergélisol; utiliser l'imagerie satellitaire et les technologies connexes, de plus en plus accessibles, pour mieux prévoir les crues; et exploiter de nouvelles espèces allogènes pour poursuivre les activités de pêche, de chasse et de récolte commerciales et de subsistance.

D'autres mesures potentielles visent plutôt la santé humaine, la sécurité publique, la culture et le patrimoine : protéger les établissements et les services de santé des risques associés aux changements climatiques, surtout en cas de phénomène météorologique extrême; évaluer ces risques et en tenir compte dans les plans d'urgence des collectivités; et accroître la résilience des collectivités en misant sur leur épanouissement culturel et social. Dans cette optique, il faut préserver et utiliser le savoir traditionnel et local, et faire participer les jeunes et les aînés aux programmes d'initiation à la vie dans la nature pour transmettre ce savoir aux générations futures.

En ce qui concerne les transports, l'électricité, les communications, l'eau, les services d'assainissement et d'autres infrastructures importantes telles que les centres de santé, les écoles et les installations communautaires, citons comme éventuelles stratégies d'adaptation : resserrer les normes de construction pour que la fonte du pergélisol et les phénomènes météorologiques extrêmes soient pris en compte à toutes les étapes du projet, y compris la planification, la conception et l'exploitation; et assurer le suivi et la mise à jour des évaluations des risques pour déterminer s'il faut prendre des mesures d'atténuation ou moderniser les infrastructures (bâtiments, routes) en fonction des nouvelles conditions climatiques.

Le réchauffement climatique recèle néanmoins certaines potentialités dans des secteurs comme l'agriculture et la foresterie. La saison des cultures étant prolongée, une augmentation de la production locale pourrait remédier à des problèmes de sécurité alimentaire. Et en utilisant de plus en plus la biomasse ténoise (bois de corde et granules), les TNO pourraient se doter de solutions locales et créer des emplois. Ces deux secteurs collaborent à la réduction des émissions de gaz à effet de serre.

PROCHAINES ÉTAPES

Pour chacun des trois objectifs du Cadre, les mesures potentielles à inclure dans le Plan d'action 2019-2023 ont été sommairement définies, tout comme les moyens de communiquer l'information sur les changements climatiques et d'aider les collectivités à y faire face. Il faut à tout prix diffuser largement l'information et mobiliser les collectivités à tous les niveaux de cette quête d'acquisition de nouvelles connaissances.

Les mesures potentielles orienteront l'élaboration, puis l'application du Plan d'action 2019-2023. Tout au long de son exécution, il y aura des rapports annuels sur les progrès réalisés et les ajustements nécessaires. Après cinq ans, le plan sera évalué et remplacé par une nouvelle version (2025-2029).

Comme le montre le Cadre, d'importantes démarches ont été entreprises en réponse aux recommandations formulées par le Bureau du vérificateur général du Canada dans son rapport d'octobre 2017 sur les changements climatiques aux TNO. Le plan d'action détaillé découlant du Cadre traitera plus spécifiquement de ces recommandations.

La réalisation du Plan d'action passera par le partage des responsabilités et la collaboration avec les administrations communautaires, les gouvernements autochtones et les autres parties concernées. Le ministère de l'Environnement et des Ressources naturelles, responsable de la lutte contre les changements climatiques, jouera un rôle prépondérant dans les efforts de concertation tant aux TNO qu'avec les autres territoires, les provinces et le gouvernement fédéral.

En conclusion, les TNO comptent sur le Cadre pour faire face aux défis que présentent les changements climatiques et en exploiter les potentialités, passer à une économie plus sobre en carbone et contribuer aux efforts nationaux et internationaux déployés pour la cause.

1.0
Introduction – Climate Change

The Northwest Territories (NWT) is a largely undisturbed landscape with unique ecosystems that have supported Indigenous people for millennia. Covering more than one million square kilometres, the NWT is home to approximately 44,000 people who are spread across the territory in 33 communities.

NWT residents have a long-standing relationship with the land. Indigenous people draw their spiritual and cultural identity from the land and many still practice a traditional lifestyle that includes hunting, fishing, trapping and gathering. Maintaining residents' health, safety and wellness, and cultural practices is critical.

The territory has world-class mineral and petroleum deposits and significant renewable energy resources that offer great potential for development and much needed economic benefit.

Despite abundant renewable and non-renewable resource potential, the NWT economy depends heavily on imported fossil fuels to meet its energy needs. This dependence on fossil fuels results in significant greenhouse gas emissions (GHGs) (on a per-capita basis) and contributes to the high cost of living and doing business in the NWT.

1.0 Introduction – Climate Change

The science is clear that human activities, particularly the burning of fossil fuels, cause climate change and are a major contributor to increasing global average temperatures. Even though the NWT's emissions make up just 0.2% of Canada's total GHG emissions, climate change effects are being acutely experienced across the territory.

Climate change is a long-term shift in weather conditions identified by changes in temperature, precipitation, winds and other indicators. Climate change can involve both changes in average conditions and changes in variability, including, for example, extreme events.

In the northern NWT, average temperatures are warming up to four times faster than global average temperatures while the southern NWT is warming about two times faster. The natural environment, including water, permafrost, vegetation and wildlife, is experiencing changes due to a warming climate. These changes affect the human environment, namely through pressures on health, public safety, infrastructure, food security, and culture and heritage.

The 2030 NWT Climate Change Strategic Framework (the Framework) outlines how the territory as a whole plans to respond to challenges and opportunities associated with climate change, move towards a lower-carbon economy and do its part to contribute to national and international efforts on climate change.

1.1 International and National Context

During the 21st session of the United Nations' Conference of the Parties, held December 2015 in Paris, France, representatives of 195 countries reached agreement on a new global climate change accord known as the Paris Agreement. Key objectives of the Paris Agreement include GHG mitigation, adaptation and financing initiatives to begin in 2020. Specifically, the Paris Agreement aims to strengthen the global response to the threat of climate change by:

- Holding the increase in global average temperature to well below 2˚C (above pre-industrial levels) and pursuing efforts to limit the temperature increase to 1.5˚C; and
- Increasing the ability to adapt to the adverse impacts of climate change and foster climate resilience.

Under the Paris Agreement, Canada is committed to a 30% reduction in annual emissions from 2005 levels, by 2030. To implement this commitment, the federal government, provinces and territories worked together to develop the Pan-Canadian Framework on Clean Growth and Climate Change, which was released in December 2016. It provides broad direction and guidance relevant to all Canadian jurisdictions. The NWT will build upon these efforts to address climate change within our territory.

The Pan-Canadian Framework has four main pillars for addressing climate change:

- Pricing carbon pollution;
- Measures to reduce greenhouse gas emissions;
- Measures to adapt to the impacts of climate change and build resilience; and
- Actions to accelerate innovation, support clean technology and create jobs.

1.2 NWT Greenhouse Gas Emissions

Greenhouse gas emissions are increasing average global temperatures and causing climate change. Taking strong action to address emissions is critical, and the need to act is urgent.

Carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons and sulfur hexafluoride are the six main GHGs. Each of these gases persists for a different length of time in the atmosphere and has a different global warming potential. All GHG emissions are measured as carbon dioxide equivalents (CO_2e) to allow for comparison.

1.0 Introduction – Climate Change

Figure 1: NWT Historical Greenhouse Gas Emissions (1990-2016)

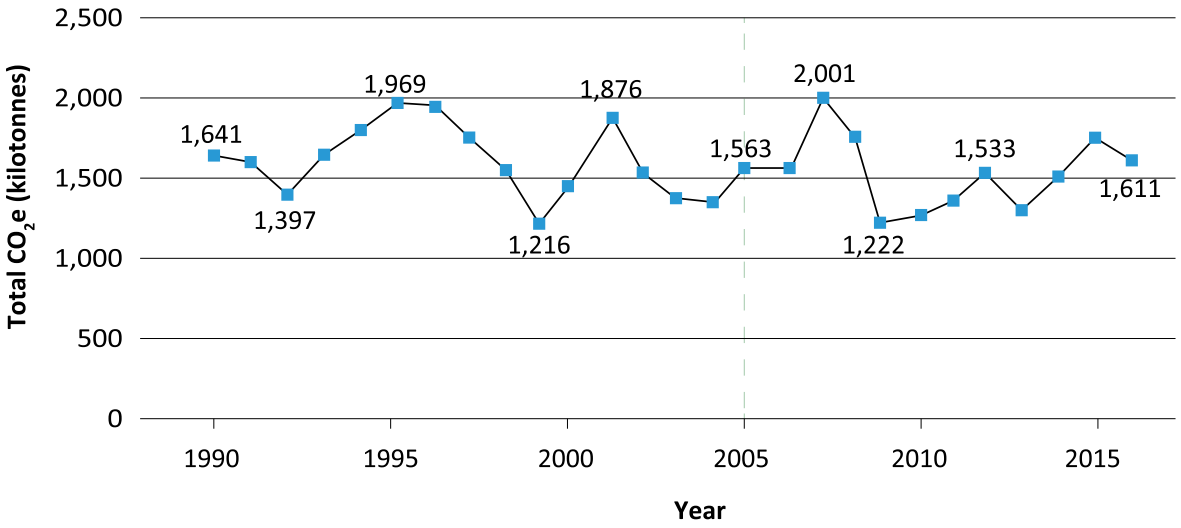


Figure 1 shows the NWT's total annual GHG emissions, measured from human-caused sources from 1990 to 2016, in kilotonnes (kt) of CO_2e.

Approximately 96% of the NWT's annual human-caused emissions are due to fossil fuel use. The other 4% comprises emissions from minor sources such as waste and the oil and gas industry.

Each year, the NWT's annual emissions fluctuate depending on how much fossil fuel is consumed. In turn, the NWT's annual fossil fuel requirements are driven by the level of economic activity, the climatic conditions experienced and the level of investment in energy efficiency and renewable energy systems.

Natural sources and sinks of GHG emissions in the NWT include lakes, rivers, wetlands, forests and oceans. Forests and oceans are generally considered carbon sinks as they store more GHGs than they release. As permafrost thaws, the carbon stored in the frozen ground is released and more GHG emissions can result. Since there is minimal data on natural sources and sinks of GHGs, they have not been accounted for in the NWT GHG emissions levels presented in the Framework. However, as temperatures continue to rise, research, modeling and monitoring will be necessary to better understand the impacts of thawing permafrost, changing vegetation, lakes, rivers, wetlands and oceans, as well as wildland fires and insect outbreaks, on GHG emissions.

Since 2009, the NWT's total annual GHG emissions from human-caused sources have been relatively stable, varying between 1,220 and 1,720 kt CO_2e, due to annual fluctuations in economic activity and fossil fuel consumption.

In 2016, the most recent year for which data are available, the NWT's GHG emissions were 1,611 kt CO_2e – representing about two-tenths of one percent (0.2%) of Canada's annual GHG emissions. More information on the human-caused sources of NWT GHG emissions is provided in Section 3.0.

While the NWT is not a large contributor to national or global emissions, it is still very important that the NWT economy continues to move from a dependence on imported fossil fuels towards increased use of local and renewable energy sources to reduce the cost of living and build resilient, efficient communities.

1.3 UNDERSTANDING CLIMATE CHANGE

The NWT is situated in a cold arctic and subarctic climate. The plants, wildlife and people that live here have adapted to this cold climate and depend on it to maintain the conditions needed to thrive.

The northern NWT is experiencing rapid average annual temperature increases – up to four times faster than global averages – while the southern NWT is warming about two times faster (see Figure 2). This degree of warming is significant and has serious implications for the NWT.

Over the past 100 years, global average surface temperatures have warmed by about 1°C. In arctic and subarctic regions, average surface temperatures have increased much faster than the global average due to differences in atmospheric conditions and reduced sea ice coverage. This phenomenon is known as arctic amplification.

Computer model projections indicate that without global action to reduce GHG emissions, average annual temperatures in the northern NWT could increase by as much as 8°C to 10°C by 2100. If global efforts to significantly reduce emissions are successful, the northern NWT may experience less severe temperature increases – likely in the range of 4°C to 6°C. The southern NWT is not predicted to exhibit the same level of warming as northern areas. However, it is still anticipated to experience greater warming than other parts of Canada and much of the world.

While future temperature increases cannot be predicted with certainty, it is clear that warming trends will continue over the long-term, and will be most pronounced during shorter winter seasons, impacting ice quality and travel over ice. The NWT has been experiencing detrimental effects from climate change for decades. The impacts, which are increasing in severity as the warming progresses, include thawing permafrost, shrinking sea ice, coastal erosion, flooding, wildland fire, drought and impacts on vegetation and wildlife. The extent and rate of the changes have serious implications for the NWT, including community and territorial infrastructure, the well-being of residents and the viability of some economic activities.

1455

1.0 Introduction – Climate Change

Figure 2: Observed Historical Rates of Warming – Hay River and Inuvik (1958-2015)

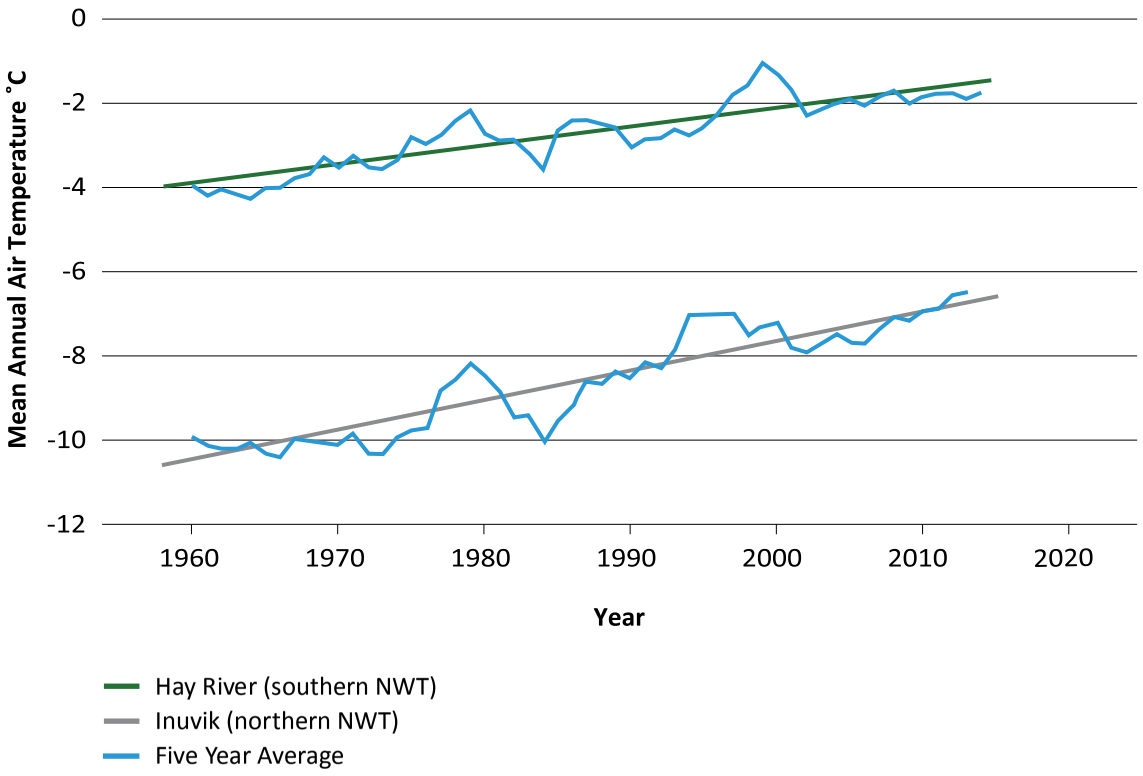


Figure 2 illustrates observed warming in mean annual air temperature at Hay River and Inuvik airports from 1958-2015. The rate of warming is greater in the northern NWT (Inuvik) compared to the southern NWT (Hay River).

1.4 WHY WE NEED A NWT CLIMATE CHANGE STRATEGIC FRAMEWORK

The NWT must address climate change by doing its part to reduce fossil fuel use and GHG emissions. As the northern climate continues to warm, the NWT must prepare to increase the resilience of its communities, and find ways to adapt to the changes already happening or yet to come.

Climate change represents serious and urgent challenges for the NWT. Recognizing this urgency, the 18th Legislative Assembly made mitigating and adapting to climate change a key priority of its term and the Government of the Northwest Territories (GNWT) committed in its mandate to developing a territorial climate change strategy.

Key Climate Change Concepts

- **Mitigation** aims to reduce the causes of climate change.
- **Building resilience** focuses on finding ways to withstand the climate-related changes that are occurring or yet to come.
- **Adaptation** involves modifying decisions, activities and ways of thinking to adjust and respond to a changing climate.

1.0 Introduction – Climate Change

The Framework is the NWT's roadmap for addressing climate change from 2018 to 2030.

The purpose of the Framework is to comprehensively address the following climate change issues:

- *GHG Emission Targets:* New targets, consistent with the Pan-Canadian Framework on Clean Growth and Climate Change, have been set for the NWT to achieve by 2030. This is necessary to replace the targets from the previous 2011-2015 NWT Greenhouse Gas Strategy (which expired in March 2016) and to indicate how the NWT is contributing to Canada's objectives under the 2015 Paris Agreement;
- *Resilience and Adaptation:* Describing how the NWT can respond to a warming climate by increasing the resilience of communities and finding ways to adapt to the changes already happening or yet to come; and
- Recommendations from the Office of the Auditor General of Canada's Climate Change in the NWT audit report, which was tabled in the Legislative Assembly in October 2017.

This Framework sets out a clear vision to guide all GNWT initiatives on how to consider and address climate change. Under each goal in the Framework (Section 2.2), efforts needed to address climate change in the NWT have been identified. During the development of the 2019-2023 Action Plan to implement the Framework, these efforts will be prioritized and actions for implementation will be defined.

Climate Change Audit

In October 2017, the Office of the Auditor General of Canada submitted its report, *Climate Change in the Northwest Territories*, to the NWT Legislative Assembly. This audit focused on whether the Department of Environment and Natural Resources and the Department of Infrastructure previously took adequate steps to meet their commitments to reduce territorial GHG emissions and to adapt to climate change impacts in the NWT.

Through releasing the 2030 NWT Climate Change Strategic Framework, the Government of the Northwest Territories has taken a significant step towards addressing key recommendations made by the Auditor General. In addition, a detailed Action Plan being developed in 2018 will provide for ongoing assessment and adaptive management as needs evolve. See Appendix A for details on how the Auditor General's recommendations have been addressed in this Framework.

1.0 Introduction – Climate Change

For clarity, it should be noted that the Framework does not include detailed information on climate change topics that are dealt with in other GNWT strategies or are still under development. These include:

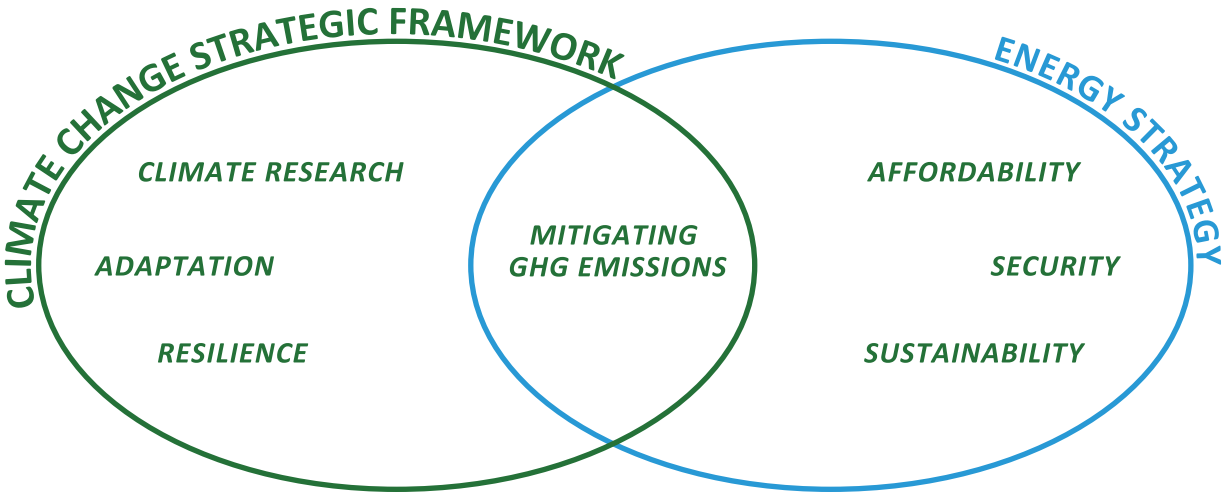
- *Energy:* The 2030 Energy Strategy is the mechanism for reducing GHG emissions related to energy supply and consumption. The associated Three Year Energy Action Plan (2018-2021) describes the actions and investments required to meet the NWT's GHG emission targets.
- *Carbon Pricing:* The GNWT intends to honour its carbon pricing commitment under the Pan-Canadian Framework on Clean Growth and Climate Change. The GNWT is working on an approach to implement carbon pricing that encourages carbon conservation and substitution to reduce GHG emissions while minimizing the effect on the local cost of living and the creation of additional barriers to economic development. The GNWT approach to carbon pricing will be announced in a separate document.

1.5 LINKS WITH OTHER PLANS AND STRATEGIES

Efforts to address climate change in the NWT need to be integrated and aligned with other important goals and considerations in the territory.

The 2030 Energy Strategy and this Framework were developed at the same time and share common elements in terms of their respective vision statements, goals and objectives, along with GHG emissions reduction targets.

The Framework sets the NWT's overall approach to addressing climate change. As a cross-cutting issue, climate change considerations affect the objectives and actions of many other strategies and plans, both within and external to the GNWT.



To the greatest extent possible, the development and implementation of the Framework is intended to be consistent with, and supportive of, the following strategies and plans:

- Paris Agreement (2015)
- Pan-Canadian Framework on Clean Growth and Climate Change (2016)
- 2030 Energy Strategy – A Path to More Secure, Affordable and Sustainable Energy in the Northwest Territories (2018)
- Carbon Pricing Approach (under development)
- NWT Petroleum Resources – A Path to Northern Benefits and Energy Security (2018)
- GNWT Knowledge Agenda (2017)
- NWT Water Stewardship Strategy (2010) and Action Plan (2016-2020)
- GNWT Land Use and Sustainability Framework (2014)
- NWT Economic Opportunities Strategy (2013)
- NWT Mineral Development Strategy (2013) and Implementation Plan (2014-2019)
- NWT Agriculture Strategy – The Business of Food: A Food Production Plan (2017-2022)
- Healthy Land, Healthy People – GNWT Priorities for Advancement of Conservation Network Planning (2016-2021)
- Strong Cultures, Strong Territory – GNWT Culture and Heritage Strategic Framework (2015-2025)
- Strategy for Revitalizing the Great Slave Lake Commercial Fishery (2017)
- NWT Geological Survey Strategic Plan (2017-2022)
- Inuit Priorities for Canada's Climate Strategy (2016) and National Inuit Climate Change Strategy (2018)
- NWT Waste Resource Management Strategy (under development)
- NWT Manufacturing Strategy (under development)
- Northern Adaptation Strategy (under development by Crown-Indigenous Relations and Northern Affairs Canada in collaboration with the GNWT and other northern governments)

1459

2.0
2030 NWT Climate Change Strategic Framework

The GNWT understands the implications of climate change and is committed to working with community, Indigenous, territorial, provincial and federal governments, non-government organizations, industry and other stakeholders to address these challenges through the implementation of the Framework.

2.1 WHAT WE HEARD

The GNWT conducted a series of engagement activities during the fall and winter of 2016-2017 in Inuvik, Norman Wells, Fort Simpson, Hay River, Fort Smith and Yellowknife to gather input on both the Framework and the 2030 Energy Strategy. In addition to the workshops, other engagement activities included a public survey, written submissions and public feedback on the draft Framework.

Key input received by the GNWT pertained to the following areas:

- *Setting GHG Emissions Targets:* There was general agreement that the NWT should set emissions reduction targets to demonstrate its commitment to addressing climate change and align with or surpass Canadian targets;
- *Reducing Fossil Fuel Use:* There was a strong interest in energy efficiency and the development of local renewable energy options to reduce fossil fuel use, both in communities and by industry;
- *Implementing Carbon Pricing:* There was a mixed response to carbon pricing. Some respondents expressed concern about potential increases to the already high cost of living and doing business, while others felt it was critical for reducing GHG emissions. Ideas on how the GNWT should use carbon tax revenues included rebates to residents and investments in initiatives that reduce fossil fuel use and/or build resilience to climate change impacts;
- *Increasing Research and Monitoring Efforts:* Respondents expressed concern about numerous climate change impacts. There was a strong interest in additional research and monitoring initiatives to better understand and predict territorial impacts;
- *Respecting Aboriginal and Treaty Rights:* The need for meaningful engagement and consultation where Aboriginal and Treaty rights may be negatively impacted by climate change mitigation and adaptation efforts was highlighted;
- *Involving Communities:* Communities expressed a strong interest in being much more involved in identifying, planning and completing research and monitoring, as well as adaptation activities. Specific suggestions included better partnerships between communities and researchers, and increasing the use of traditional and local knowledge;
- *Building Community Capacity:* Building capacity through training, mentoring and adequate resourcing to facilitate community involvement in research, monitoring and adaptation efforts was highlighted by many;
- *Communication and Outreach:* Respondents stated that regular, consistent and transparent communication and outreach on climate change findings is necessary to ensure communities have access to the best available information to support their participation in relevant decision-making;
- *Building Resilience and Adapting to Changes:* Key areas of concern brought forward included ecosystem and environmental management, better planning for future infrastructure and addressing impacts to people, such as food security, air and water quality, access to the land (e.g. as ice conditions change) and emergency preparedness; and
- *Authority for Climate Change Mitigation and Adaptation:* Many respondents stressed the need for clarity with respect to the authorities of specific GNWT departments in implementing climate change mitigation and adaptation efforts.

This important feedback was carefully reviewed and integrated into the development of the Framework and its vision, guiding principles and goals.

2.0
2030 NWT Climate Change Strategic Framework

2.2 VISION, GUIDING PRINCIPLES AND GOALS

Vision

By 2030, the NWT will enjoy a strong, healthy economy that is less dependent on fossil fuels (compared to 2005) and will have developed the knowledge, tools and measures needed to increase resilience and adapt to the changing northern climate.

Guiding Principles

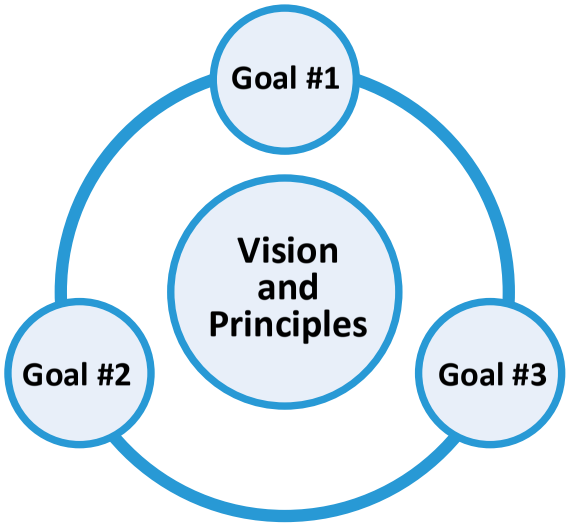
The vision of the Framework is supported by several guiding principles:

- *Taking Action:* The NWT is experiencing significant climate change impacts and must continue to take immediate action. Climate change considerations need to be included in all relevant planning, decision-making and operations;
- *Meeting Climate Change Commitments:* The NWT has a responsibility to contribute to national and international efforts to address climate change, particularly in reducing fossil fuel use and GHG emissions;
- *Sharing Responsibility:* The responsibility for taking action on climate change is shared by all segments of NWT society, including governments, businesses and residents;
- *Strong Collaboration:* Strengthening the collaboration between governments – including community and Indigenous governments, stakeholders and residents – on mitigation and adaptation actions, based on recognition of rights, respect, cooperation and partnership;
- *Respecting Aboriginal and Treaty Rights:* Climate change mitigation and adaptation decisions respect Aboriginal and Treaty rights, including land, resource and self-government agreements;
- *Traditional, Local and Scientific Knowledge:* Accessing all knowledge types to understand and make decisions related to climate impacts and adaptation measures; and
- *Transparency and Accountability:* Decisions made to implement the Framework are transparent and accountable.

Goals

The NWT is focusing on ***three climate change goals*** to achieve the vision:

- *Goal #1:* Transition to a strong, healthy economy that uses less fossil fuel, thereby reducing greenhouse gas emissions by 30% below 2005 levels by 2030.
- *Goal #2:* Improve knowledge of the climate change impacts occurring in the NWT; and
- *Goal #3:* Build resilience and adapt to a changing climate.



Under Goal #1, the GNWT is committing the NWT to the same 30% reduction in its annual GHG emissions (compared to 2005) that Canada agreed to under the Paris Agreement (2015).

For Goal #2, numerous research and monitoring projects or programs have been undertaken. However, there is still a need to understand more about the impacts and opportunities associated with a warming climate. Developing a better understanding of current and future impacts and opportunities by 2030 is the NWT's most critical climate change need, and supports Goal #3.

Goal #3 describes the overall outcome that the NWT is striving to achieve over the long-term. While there are resilience and adaptation actions that can and should be implemented today, many of the potential impacts and opportunities from climate change are complex and not yet sufficiently understood. Further progress on Goal #2 is essential to provide the informational foundation needed to build resilience and adapt to a changing climate over time.

2.3 2030 MILESTONE

To achieve the vision of the Framework, the GNWT has selected the year 2030 as a significant milestone for setting targets and measuring progress towards meeting its goals, consistent with the Paris Agreement (2015) and Pan-Canadian Framework on Clean Growth and Climate Change (2016).

For planning and tracking purposes, the timeline to 2030 is divided into several distinct phases:

2018: Release Framework and develop the accompanying 2019-2023 Action Plan

2019-2023: Implement the 2019-2023 Action Plan and complete yearly reviews and adjustments

2024: Complete a comprehensive review of the Framework and 2019-2023 Action Plan, and develop a new five-year Action Plan

2025-2029: Implement the 2025-2029 Action Plan and complete yearly reviews and adjustments

2030: Conduct a second comprehensive review of the Framework and 2025-2029 Action Plan, and update and renew accordingly

Yearly review of the progress made to achieve targets and goals, as well as the need for adjustments, will be reported in an annual report.

These timeframes are utilized in Section 3.1 for reviewing progress and adaptive management related to GHG emissions targets and elaborated upon in Section 8.2.2 to describe the Framework implementation and renewal process.

3.0
Goal #1 – Transition to a Lower Carbon Economy

Photo: NT Power Corporation

To achieve Goal #1 by 2030, the NWT economy needs to remain strong and viable while taking concrete actions to gradually reduce GHG emissions. This means growing the economy while at the same time reducing fossil fuel use and associated emissions. Separating economic growth from fossil fuel consumption will require substantial capital investments in energy efficiency and local supplies of renewable and lower carbon energy sources. In the NWT, 23 of 33 communities rely on diesel for electricity generation. This is a major challenge and one that requires significant investment in alternative energy solutions to address.

3.1 NWT ANNUAL GREENHOUSE GAS EMISSIONS TARGETS

Canada is committed to achieving or exceeding a 30% reduction in annual GHG emissions from 2005 levels by 2030.

The NWT's annual GHG emissions are calculated by Environment and Climate Change Canada (ECCC) as part of Canada's National Inventory Report. In 2005, the NWT's total GHG emissions were 1,563 kt CO_2e. To achieve its 30% emissions reduction target, the NWT's total annual GHG emissions need to be reduced to 1,094 kt CO_2e by 2030, as shown in Figure 3.

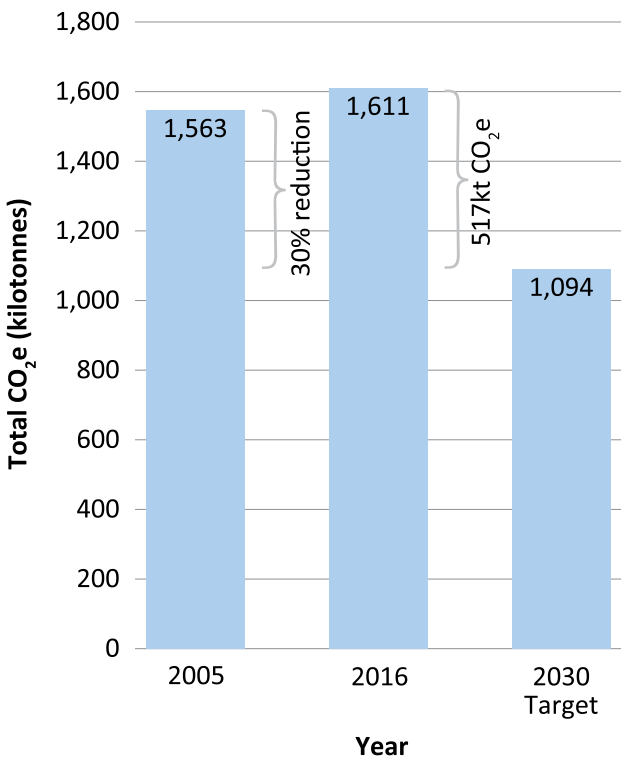
One kilotonne (kt) of GHG emissions, measured in CO_2e, is equivalent to using approximately 376,900 litres of heating oil to heat 151 NWT homes for one year. Replacing heating oil with about 514 tonnes of wood pellets or 642 cords of wood could prevent this kilotonne of emissions.

To provide milestones for measuring progress, total emission targets for the NWT are shown below. The 2020 milestone reflects a modest reduction in emissions, as it is based only on actions that can be taken immediately. The 2025 and 2030 milestones are more ambitious, as these reflect actions that require more time to plan and implement, but result in bigger reductions in emissions:

- 2020 milestone target = 1,550 kt CO_2e (61 kt CO_2e or 3.7% reduction over 4 years from 2016)
- 2025 milestone target = 1,400 kt CO_2e (150 kt CO_2e or 9.7% reduction over 5 years from 2020)
- 2030 final target = 1,094 kt (306 kt CO_2e or 21.9% reduction over 5 years from 2025)

The milestone emissions targets will help to inform the development of successive five-year Action Plans (2019-2023 and 2025-2029) and provide the basis for assessing progress.

Figure 3: NWT's Historical and Target Greenhouse Gas Emissions (2005-2030)



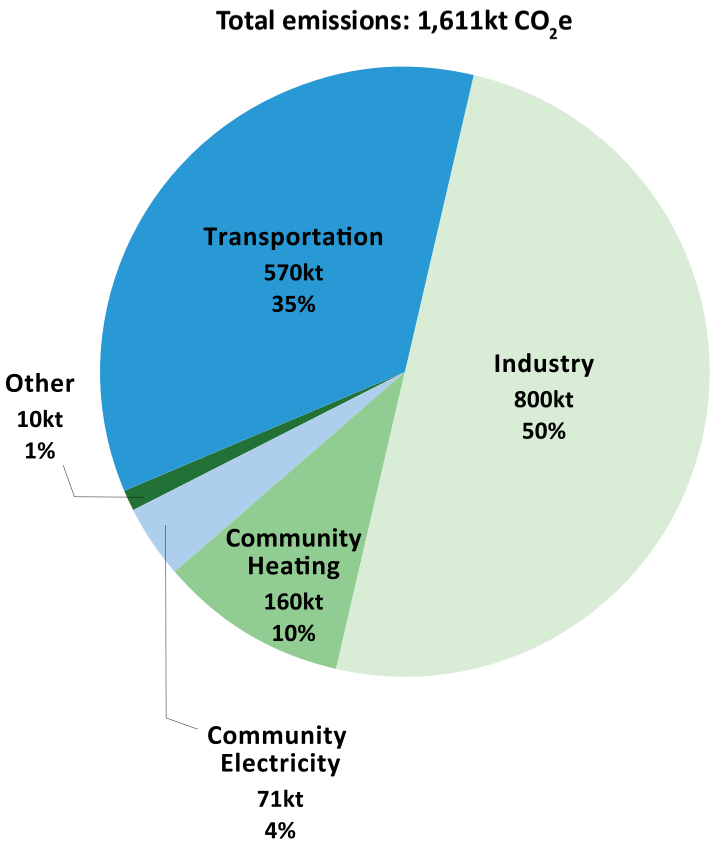
1465

3.0
Goal #1 – Transition to a Lower Carbon Economy

3.2 NWT SECTOR-SPECIFIC GHG EMISSIONS

Each year, data from ECCC's National Inventory Report and GHG Reporting Program are used to estimate the NWT's sector-specific emissions. Most GHG emissions in the NWT for 2016 are from fossil fuel use for electricity, space heating, transportation and industry as illustrated in Figure 4.

Figure 4: 2016 NWT Sector-specific Greenhouse Gas Emissions



Notes:

Industry – includes emissions from heat, electricity and vehicles from mining, oil and natural gas facilities, as reported in the GHG Reporting Program. Emissions from NWT Power Corporation and Northland Utilities are included in the Electricity sector.

Transportation – includes emissions from domestic aviation, rail transportation, marine transportation and road transportation.

Community Heating – includes emissions generated from fuels consumed by commercial and institutional buildings and residential housing.

Community Electricity – includes emissions from power generation in diesel communities.

Other – includes emissions from the treatment and disposal of wastes, such as landfills, biological treatment of solid waste, incineration and open burning of waste, and wastewater treatment and discharge.

3.3 NWT GREENHOUSE GAS EMISSION REDUCTION EFFORTS

The NWT is a signatory to the Pan-Canadian Framework on Clean Growth and Climate Change and is committed to doing its part to contribute to national and international efforts to reduce GHG emissions.

During 2016 and 2017, the GNWT undertook extensive public engagement and analytical work to develop a draft Framework and a draft 2030 Energy Strategy. This work was based on the understanding that the NWT's annual emissions in recent years were stable and that reducing emissions by 290 kt CO_2e, to 30% below the 2005 level, was achievable with no major impacts on the NWT economy.

In early 2018, ECCC made changes to the methods used to estimate Canada's emissions as part of its preparation of the 2018 National Inventory Report. These updates to how emissions are calculated addressed some past errors and changes to modelling methodology. The GNWT will continue to work with ECCC to increase the accuracy of how the NWT's emissions are estimated and publicly reported.

3.0 Goal #1 – Transition to a Lower Carbon Economy

The 2018 National Inventory Report indicates that the NWT's current level of emissions, as shown in Figure 4, is higher than previously understood. Therefore, to reach the 2030 target of 1,094 kt CO_2e, the NWT needs to reduce its total annual emissions by 517 kt CO_2e, or 32%, based on current GHG emissions estimates.

It is important to note that, as the NWT's emissions are comparatively small, representing only 0.2% of Canada's total GHG emissions, any significant changes in annual emissions estimates can substantially affect the NWT's ability to meet its emission reduction targets.

Mechanisms available to the NWT to reach its 2030 emissions target are described below.

The 2030 Energy Strategy identifies six Strategic Objectives to achieve the GNWT's vision of a more secure, affordable and sustainable energy system in the NWT.

The Strategic Objectives are:

1. Work together to find solutions through community engagement, participation and empowerment.
2. Reduce GHG emissions from electricity generation in diesel powered communities by an average of 25%.
3. Reduce GHG emissions from transportation by 10% per capita.
4. Increase the share of renewable energy used for space heating to 40%.
5. Increase residential, commercial and government building energy efficiency by 15%.
6. A longer term vision: develop the NWT's energy potential, address industry emissions and do our part to meet national climate change objectives.

3.3.1 2030 Energy Strategy

The 2030 Energy Strategy outlines how the NWT can improve its energy systems and reduce emissions. Detailed actions and investments are described in an associated Three Year Energy Action Plan (2018-2021). Together, these two documents address energy efficiency, electricity generation in diesel communities, renewable energy for community heating, energy used for road transportation and industry, and development of the NWT's energy potential.

The GNWT heard consistently from the public that it should be innovative and do more to address emissions. Innovation, including connecting industry and communities to renewable energy, would significantly reduce NWT emissions and stabilize the cost of living and doing business in the NWT.

One example of an innovative transformative project is to bring renewable energy to industry through the development of the Taltson hydroelectric project, which has the potential to reduce industrial emissions by about 240 kt. This project, and several others, was identified in the NWT annex in the Pan-Canadian Framework on Clean Growth and Climate Change. To proceed, these projects require federal government support.

1467

3.0
Goal #1 – Transition to a Lower Carbon Economy

3.3.2 Carbon Pricing

Under the Pan-Canadian Framework on Clean Growth and Climate Change, all jurisdictions in Canada are required to implement some form of carbon pricing in 2018. While provinces and territories have the flexibility to choose the type of carbon pricing system to implement, the federal government will introduce a carbon price backstop (tax) in jurisdictions that do not meet the federal carbon pricing benchmark. The federal carbon pricing benchmark specifies that jurisdictions must implement carbon pricing systems that are equivalent to $10 per tonne of emissions in 2018 and increase by $10 per tonne annually to $50 per tonne in 2022.

The GNWT must decide between using the federal carbon price backstop and implementing its own carbon pricing system. The GNWT is working on an approach to carbon pricing that encourages carbon conservation and substitution to reduce GHG emissions while minimizing the effects on the local cost of living and additional barriers to economic development. The GNWT approach to carbon pricing will be announced in a separate document.

3.3.3 Sector-specific GHG Emission Reduction Targets

Based on the strategic objectives and actions in the 2030 Energy Strategy – including the Taltson hydroelectric development and the estimated impact from a $50 per tonne carbon tax – the estimated GHG emissions reductions that can be achieved on a sector-by-sector basis by 2030 are illustrated below.

It is estimated that the implementation of actions in the 2030 Energy Strategy, as well as carbon pricing, will reduce territorial emissions by 290 kt, with an additional reduction of 227 kt from innovative transformative projects, for a total reduction of 517 kt from 2016 levels, by 2030. This will enable the NWT to meet the Pan-Canadian Framework.

3.3.4 Other GHG Emission Reduction Initiatives

Other options for reducing GHG emissions that are not energy-related are outlined below:

New Resource Development Projects: In the NWT, proposed resource development projects, along with other large infrastructure projects, are generally evaluated through an environmental impact assessment process administered by either the Mackenzie Valley Environmental Impact Review Board or the Environmental Impact Review Board (Inuvialuit Settlement Region). Once an environmental assessment is complete, the project enters a water licensing and land use permitting phase with the Mackenzie Valley Land and Water Board (or regional panels) or Inuvialuit Water Board.

It is important to ensure that future resource development projects take all reasonable steps to minimize their carbon footprints at the outset. It is also necessary to consider climate change impacts on the environment that could affect the viability and closure of a project. The GNWT will work with relevant boards, key federal agencies and industry to support the incorporation of GHG emissions mitigation and climate change adaptation strategies into environmental assessment, water licensing and land use permitting processes.

Carbon Sinks: NWT forests, tundra vegetation, wetlands, rivers, lakes and oceans store carbon and, as such, are considered carbon sinks. Minimal data exists on natural carbon sinks in the NWT, and so further monitoring, research and modeling will be necessary. Natural occurrences can also cause these carbon sinks to become carbon sources (e.g. wildland fires release stored carbon; methane is released from wetlands). The methodologies for calculating carbon sinks and sources are complex and need to be fully explored to determine the role of these environmental components in reducing GHG emissions.

Composting Organic Waste: In 2015, an estimated 6.3 kt CO_2e were emitted from solid waste in the NWT. These emissions are the result of landfill gas (primarily methane and carbon dioxide), which is created from the anaerobic decomposition of organic wastes in landfills. Diverting organic waste from landfills and into composting programs can decrease these GHG emissions.

Composting results in organic matter that can be used to fertilize gardens to grow food. Rich organic soils are not common in many parts of the NWT, presenting challenges for local agriculture, but the production of compost can enrich soil for local food production. Additionally, growing food locally can reduce GHGs emissions resulting from the transportation of food from southern provinces and improve food security in the NWT.

A number of schools, communities, businesses and organizations in the NWT have implemented composting projects with support from the GNWT. Continued composting at remote industrial sites and at the community level will help reduce GHG emissions and support increased local food production.

Composting at the Ekati Diamond Mine

Due to the remote nature of industrial developments in the NWT, organic waste has been historically incinerated using diesel as the combustion source. In 2015, Dominion Diamond Ekati Corporation installed an in-vessel composter at the Ekati Diamond Mine and has significantly reduced the volume of waste incinerated. To date, an estimated 299,500 litres of diesel fuel have been saved, equivalent to about 0.84 kt CO_2e.

1469

3.0
Goal #1 – Transition to a Lower Carbon Economy

Waste Resource Management Strategy:
The GNWT is developing a Waste Resource Management Strategy for the NWT. This Strategy will provide a 10-year roadmap for improving waste management practices in the territory.

A major focus of the Waste Resource Management Strategy will be shifting away from a disposal model to an integrated waste management approach that emphasizes waste prevention, reuse and recycling. This Strategy will also focus on improving the management of waste sent to landfills to maintain the quality of our land, air and water, as well as the health of wildlife, plants, ecosystems and people living in the NWT.

Recycling in the NWT

Recycling is another way to reduce GHG emissions. As part of the NWT beverage container recycling program, residents diverted 1,233 tonnes of beverage containers from landfills in 2016-2017. The GHG emissions avoided by recycling these materials were equivalent to approximately 2.5 kilotonnes CO_2e – the same as taking 52 cars off NWT roads from 2016 to 2017.

The GNWT is gathering input from community and Indigenous governments, businesses, other stakeholders and the public to inform the development of the Waste Resource Management Strategy, which is targeted for completion in 2019.

3.4 EMISSIONS TRACKING AND REPORTING

Accurate tracking of GHG emissions is an important part of assessing the NWT's environmental performance and measuring progress towards meeting GHG reduction targets. The GNWT and large emitters in the NWT report emissions to various agencies to comply with federal reporting requirements and/or for voluntary reasons.

3.4.1 GNWT Emissions Reporting

The GNWT voluntarily reports its GHG inventory, as it recognizes its role in leading by example to reduce GHG emissions. The Climate Registry is a recognized non-profit organization that designs and operates voluntary and compliance GHG reporting programs globally. Each year since 2011, the GNWT has prepared and submitted a GHG inventory to The Climate Registry. Tracking its emissions allows the GNWT to assess its progress towards achieving its GHG reduction targets.

GNWT Emissions Reductions

From 2011 to 2016, the GNWT's emissions have been reduced by 15%, from 37.4 kt to 31.6 kt CO_2e, due to energy efficiency retrofits and conversions to wood pellet heating systems.

3.4.2 Environment and Climate Change Canada – Greenhouse Gas Emissions Reporting Program

Since 2004, Environment and Climate Change Canada (ECCC) has required facilities that emit 50 kt CO_2e or more per year to submit a report through its GHG Reporting Program. For the 2015 reporting year, five facilities in the NWT submitted annual reports to the GHG Reporting Program:

1. Ekati Diamond Mine – Dominion Diamond Ekati Corporation (216 kt CO_2e)
2. Diavik Diamond Mine – Diavik Diamond Mines Inc. (169 kt CO_2e)
3. Snap Lake Mine – De Beers Canada Inc. (122 kt CO_2e)
4. Norman Wells Central Processing Facility – Imperial Oil Resources N.W.T. Limited (88 kt CO_2e)
5. Jackfish Plant – NWT Power Corporation (56 kt CO_2e)

ECCC is in the process of expanding the requirements under the GHG Reporting Program to obtain a more comprehensive picture of emissions by Canadian facilities.

The proposed changes, anticipated to take effect in 2018, will include:

- Lowering the reporting threshold from 50 kt to 10 kt. All facilities that emit 10 kt or more of CO_2e per year will be required to submit a report; and
- Requiring facilities to provide additional data and apply specific quantification methods to determine emissions. These new requirements will be gradually phased in.

When these new reporting requirements are implemented, additional facilities in the NWT will need to track and report their annual emissions. As more information becomes available from ECCC, the GNWT will work to identify and communicate with those NWT facilities that may be affected by these new reporting requirements.

3.4.3 NWT Annual Reporting

Each year the GNWT prepares and releases a NWT GHG Emissions Summary Report. Data in this report comes from ECCC's National Inventory Report, prepared in accordance with international emissions reporting guidelines, and from ECCC's GHG Reporting Program.

The GNWT will continue to work closely with ECCC to improve the accuracy of the NWT annual emissions estimate and will continue to develop and refine its reporting methods to incorporate new emissions data as it becomes available. This work will improve the consistency, accuracy and reliability of the NWT's emissions inventory and deliver a clearer picture of the NWT's emissions by sector.

The NWT's GHG Emissions Summary Report compiles NWT-specific data from the National Inventory Report and outlines the NWT's emissions, by sector. Facility-level reporting from ECCC's GHG Reporting Program is incorporated to summarize emissions from industry. The NWT GHG Emissions Summary Report compares the NWT's annual emissions to emissions targets.

The NWT's annual reporting will provide information on the progress being made to reduce territorial emissions and achieve specific targets, by sector.

3.5 GOAL #1 – PRIORITIES TO BE INCLUDED IN THE ACTION PLAN

Potential actions to be included in the 2019-2023 Action Plan that are focused on transitioning to a lower carbon economy are highlighted below.

Energy Measures

- Support the implementation of the 2030 Energy Strategy and associated actions and investments elaborated upon in the Three Year Energy Action Plan (2019-2021).

Carbon Pricing

- Implement a NWT carbon pricing system in 2019.

New Resource Development Projects

- Work with relevant regulatory boards, key federal agencies and industry to support the incorporation of GHG emissions mitigation and climate change adaptation strategies into environmental assessment, water licensing and land use permitting processes.

GHG Emission Tracking and Reporting

- Improve tracking of GHG emissions and reporting on progress towards the NWT's 2030 emission reduction target.

4.0
Goal #2 – Improve Knowledge of Climate Change Impacts

The NWT is experiencing numerous changes and increasing impacts to its natural environment, residents' health, public safety, culture and heritage, and infrastructure due to the changing climate. Developing a better understanding of current and future impacts of climate change is critical. Filling knowledge gaps through research and monitoring will be necessary to define options for building resilience and continuing to adapt to climate change. Goal #2 documents current impacts, highlights the knowledge gaps and identifies the research and monitoring needed by 2030 to ensure Goal #3, building resilience and adapting to a changing climate, can be met.

4.0 Goal #2 – Improve Knowledge of Climate Change Impacts

4.1 CLIMATE CHANGE KNOWLEDGE

Addressing current climate change impacts and predicting future impacts requires increased and well-managed knowledge of changes to the natural environment, human health, public safety, culture and heritage, and infrastructure. The best available information for determining impacts in the NWT includes traditional, local and scientific knowledge.

4.1.1 GNWT Knowledge Agenda

The NWT is experiencing a number of dynamic changes and challenges, including climate change, economic change, sustainable resource development, new technologies, health risks and social change. Decisions required to adapt to these changes should be based on the best available evidence and knowledge as derived from experience, investigation and research.

The GNWT Knowledge Agenda (2017) aims to position the NWT as an active leader, practitioner, partner and promoter of all forms of research, including western science methods, traditional and local knowledge and community-based research.

Understanding the impacts and extent of the climate-related changes occurring in the NWT will require collaboration between research and academic institutions, governments, communities and traditional and local knowledge holders. The GNWT Knowledge Agenda identifies key themes to focus research to address NWT interests, improve the quality of life of NWT residents and maintain the integrity of NWT cultures, communities and ecosystems. Achieving the goals outlined in the GNWT Knowledge Agenda will require that climate change impacts be considered in research across all themes.

The GNWT Knowledge Agenda Action Plan being developed in 2018 will provide broad direction on how the GNWT will support, organize and communicate research on the potential impacts of climate change on landscapes, resources, people and communities in the NWT. It will apply to research that employs scientific, traditional and local knowledge, as appropriate, to ensure the GNWT has the information it requires for decision-making.

4.1.2 Traditional and Local Knowledge

Traditional knowledge is defined in the GNWT Traditional Knowledge Policy as knowledge and values that have been acquired through experience and observation, from the land or from spiritual teachings, and handed down from one generation to another by Indigenous people.

As outlined in the GNWT Knowledge Agenda and several of the strategies and plans listed in Section 1.5, it is recognized that traditional knowledge and traditional knowledge-based research need to play a key role in identifying and understanding the changes occurring on the landscape, and the implications of these changes for wildlife, traditional activities and human health and well-being.

As Indigenous people represent about 50% of the NWT's population, traditional knowledge and traditional knowledge-based research need to play a key role in identifying and understanding the changes occurring on the landscape and the implications these changes have for wildlife, traditional activities and human health and well-being.

It is critically important that traditional knowledge be included in collaborative decision-making in appropriate and respectful ways, as agreed upon with traditional knowledge holders and Indigenous governments and organizations.

During the six regional engagement workshops conducted in 2016-2017 to obtain input on the Framework, Indigenous participants offered the following key suggestions regarding the use of traditional knowledge, which will be further underscored in the 2019-2023 Action Plan, as well as in the forthcoming GNWT Knowledge Agenda Action Plan:

4.0
Goal #2 – Improve Knowledge of Climate Change Impacts

- Researchers should be trained to properly access and include traditional knowledge;
- Research results derived from the use of traditional knowledge should be reported back to the communities involved for their consideration and comment; and
- Traditional knowledge can be used to help establish baselines to determine environmental and health trends and identify research needs.

Local knowledge, like traditional knowledge, is acquired through experience and observation, and can be handed down from one generation to another, but does not include the spiritual connection that Indigenous people have with the land.

Ensuring traditional, local and scientific knowledge is gathered and used appropriately and respectfully when developing and deciding upon climate change research, monitoring, mitigation and adaptation processes and actions will benefit all NWT residents and result in a more robust knowledge base.

4.1.3 Management of Knowledge

The traditional, local and scientific knowledge relevant to climate change that is being acquired through research and monitoring of the environment, human health, public safety, culture and heritage, and infrastructure in the NWT is generating enormous amounts of information in the form of physical samples, data, products and tools.

Key practitioners involved in acquiring and managing this information include community, Indigenous, territorial and federal governments, academic institutions, regulatory and resource management boards, non-government organizations and industry. Each year, numerous environmental programs and projects are undertaken throughout the NWT, but no central authority tracks or coordinates this activity, resulting in challenges related to the storage, management, analysis and sharing of data and information.

As more research and monitoring is required to address climate change-related knowledge gaps, it is clear that steps are needed to improve the capacity to manage and access the knowledge for planning and decision-making. The GNWT will develop a central repository to share knowledge and information on climate change for everyone in the NWT.

4.2 Climate Change Impacts, Knowledge Gaps and Research and Monitoring Requirements

Continuing warming trends indicate that the NWT will likely experience numerous and significant changes and impacts over the next 50 to 100 years, in addition to what is already happening in the territory (see Figure 5).

The unprecedented pace and extent of the impacts occurring must be better understood to build resilience and find ways to adapt to unavoidable changes. A significant amount of research and monitoring work is taking place in the NWT, ranging from community-based projects to territory-wide investigations. There is a clear need for additional and more extensive research and monitoring, along with focused vulnerability assessments.

A vulnerability assessment is a process for assessing, measuring and characterizing the degree to which the environment, wildlife or humans are susceptible to negative effects of climate change and their capacity to adapt to the impacts.

Input received from the public engagement efforts and subject matter specialists indicates there are many climate change knowledge gaps remaining to be addressed. An overview of climate change impacts, knowledge gaps, and research and monitoring requirements related to: 1) the natural environment, 2) human health, 3) public safety, 4) culture and heritage, and 5) infrastructure, are discussed below and elaborated upon in Appendix B.

4.2.1 Natural Environment

The warming climate is causing two different types of changes in the NWT: gradual shifts in the physical landscape and ecosystems (e.g. thawing of permafrost and migration of species) and increased occurrence of more abrupt extreme events (e.g. thaw slumps, floods, droughts and changes to wildland fire regimes). Combined, these changes have serious consequences that need to be better understood due to their environmental and fiscal impacts.

4.2.1.1 Changing Climate and Weather

The rapid warming underway in the North is directly affecting the climate (weather patterns over a long period of time) and weather (day-to-day state of the atmosphere) in the NWT.

Weather is becoming more uncertain and storms are more severe. Winter freeze-up is occurring later, spring thaw is occurring earlier, and traditional and local knowledge indicates that travel on the land, water and ice is becoming more dangerous and challenging. All of these changes make it increasingly difficult for residents of the NWT to pursue harvesting and trapping activities.

Climate and weather information is essential for understanding the health of ecosystems and climate-related impacts to support sustainable resource management decisions. Climatic information, including trends, is also required to inform adaptation planning, such as the design of new infrastructure (including industrial development) and the maintenance and/or upgrading of existing infrastructure. Future management of legacy contaminated sites needs to consider impacts resulting from changing climate and weather on long-term site structures, as well as closure strategies.

Climate and weather research and monitoring is being undertaken in the NWT by Indigenous, territorial and federal governments, communities, industry and academic institutions. However, improvements need to be made as monitoring stations and programs are lacking, some stations are not ideally located, and coordination of monitoring efforts and access to data is inadequate. Forecasted climatic data required for the design of new infrastructure, many of which will have an expected lifespan in excess of 50 years, is not yet formally published and adopted for use by design professionals.

Figure 5: Projected Future Warming for the NWT to the Year 2100

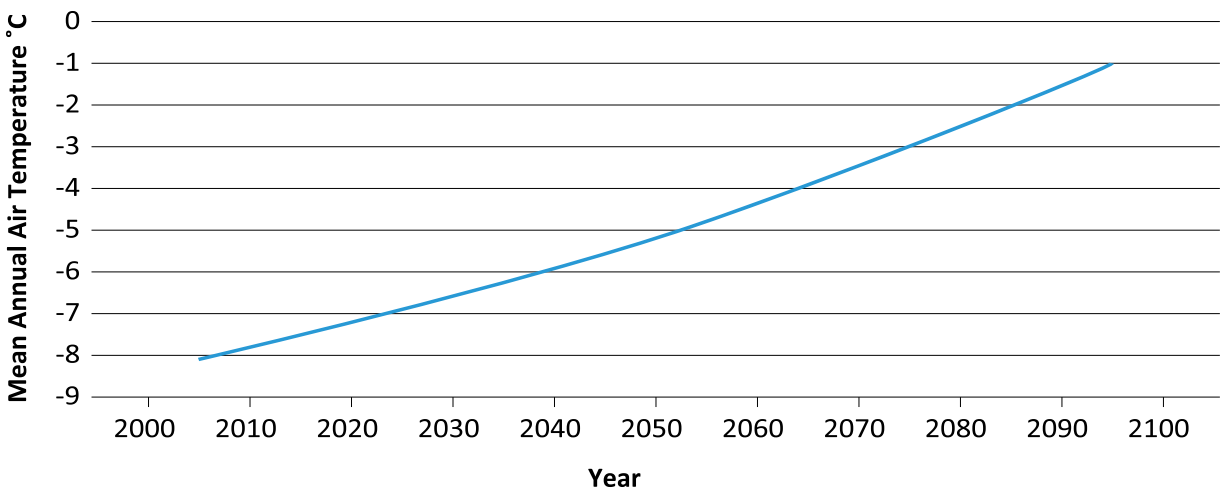


Figure 5 illustrates a climate projection for future warming. The NWT's mean annual air temperature is projected to increase by approximately 6°C by 2100 if the current emissions pathway does not change. The projection was generated by the University of Alaska Fairbank Scenarios Network for Alaska and Arctic Planning.

4.0
Goal #2 – Improve Knowledge of Climate Change Impacts

Climate and weather changes directly impact all the natural environment components described below. More detailed information on impacts, knowledge gaps, and research and monitoring requirements pertaining to climate and weather is provided in Appendix B.

4.2.1.2 Changing Permafrost

Permafrost is frozen ground that underlies most of the NWT's communities, infrastructure and natural environment. It can be thought of as the cement that holds northern landscapes together.

Permafrost Thaw

Permafrost thaw in the northwestern NWT has caused the development of very large thaw slumps that can displace millions of cubic metres of sediments, thereby reconfiguring slopes and impacting downstream environments.

In 2015, the growth of one thaw slump near Fort McPherson led to a gradual hillside collapse, resulting in the rapid partial drainage of a small upland lake. The GNWT, Indigenous governments and academic institutions are undertaking research and monitoring on this and other thaw slumps to better understand the development and impacts of thaw slumps on the landscape.

This frozen layer of earth materials can be tens to hundreds of metres thick and contain large volumes of ground ice. Thawing of permafrost and the melting of ground ice causes the ground surface to sink or settle, and reduces the stability of the terrain.

Permafrost thaw is significant to northern communities because it can damage overlying infrastructure, including roads and buildings (see Section 4.2.5), and impact heritage resources and culturally significant sites (see Section 4.2.4). The degradation of permafrost can cause rapid erosion of coasts and shorelines, as well as transform landscapes, impacting wildlife and the quality of water. Thawing of frozen organic materials also releases GHGs that contribute to overall global climate warming.

Long-term permafrost research and monitoring is underway in the NWT; however, due to limited northern capacity, the majority of GNWT activities rely on academic partnerships or collaboration with federal researchers. Northern-based technical capacity is needed to address research and monitoring gaps, support decision-making and provide technical advice to residents, planners, designers, engineers, architects, industry and all levels of government, as stresses on infrastructure, terrestrial and aquatic ecosystems continue to increase due to climate-driven permafrost thaw.

More detailed information on permafrost-related climate change impacts, knowledge gaps, and research and monitoring requirements is provided in Appendix B.

The NWT's coasts are being impacted by sea level rise and coastal erosion resulting from thawing permafrost, less ice coverage and more waves. Enhanced monitoring, modeling and projections of coastal erosion and sea level rise are required.

4.2.1.3 Changes to Water

The NWT relies on water and aquatic ecosystems for sustenance, transportation, energy production, economic growth, recreation, culture and spirituality. Climate change affects the NWT's water quality and quantity through extreme weather events, changes in flood or drought severity, increased variability in precipitation, thawing of permafrost, and melting of glaciers and polar ice sheets.

Long-term water quality and quantity monitoring is led predominantly by the GNWT and also undertaken by Indigenous and federal governments, communities, industry, academic institutions and non-government organizations. Climate change related impacts include altered water chemistry, varying river and groundwater flows, reduced ice coverage and drying of wetlands. Gaps in the monitoring network will

need to be addressed, particularly in areas more vulnerable to the effects of climate change, to further understand climate change impacts.

Changes to Groundwater Systems

Frozen ground acts as a waterproof barrier. However, as permafrost thaws, there is an increase in connections between surface, shallow groundwater and deep groundwater systems. The melting of ground ice in permafrost environments also increases the mobility of groundwater near the surface. Research and monitoring is required to understand the complexity of the changes, as some regions may see an increase in surface water flow, while at other locations drainage of surface water into the ground will occur.

The NWT is the ultimate downstream jurisdiction in the Mackenzie River Basin, in which water flows from Alberta, British Columbia, Yukon and Saskatchewan into the NWT. Consequently, climate impacts and human activity in those jurisdictions can affect aquatic ecosystems, including water quality and quantity, in the NWT. To address the transboundary challenge of climate change, bilateral water management agreements are being negotiated and implemented with neighbouring jurisdictions. This work will enable collaborative research and monitoring to assist with improved understanding and identification of potential climate change mitigation and adaption opportunities in the basin.

More detailed information on water related climate change impacts, knowledge gaps and research and monitoring requirements is provided in Appendix B.

4.2.1.4 Changes to Forests and Tundra Vegetation

The NWT contains about 80 million hectares of forested land, representing about 20% of the Canadian boreal forest. It also has a significant tundra ecosystem that includes important plant and lichen species. Residents depend on the forest and tundra as critical habitats for wildlife, as well as for subsistence harvesting, recreation and sustainable resource development. In the boreal forest, natural disturbances such as wildland fires and insect outbreaks, are necessary for forest renewal. For that reason, understanding frequency, severity and distribution of disturbances is essential to recognize abnormal trends that may result from climate change. Climate impacts include shifting vegetation – for example, forests replacing the tundra as the tree line moves northwards – and competition from species moving into the NWT.

Wildland Fire Disturbance

Climate change related impacts to forest and tundra vegetation include increases in wildland fires occurrence and severity (due to dry conditions), compromised forest productivity, and shifts or expansions in ranges of tree and plant species, diseases and pests.

Long-term forest and tundra monitoring in the NWT is undertaken predominantly by the GNWT, but is also conducted by Indigenous and federal governments and academic institutions. The growth response of NWT forests and tundra vegetation to a changing climate remains uncertain due to significant knowledge gaps, meaning long-term monitoring and research is necessary. For example, annual forest health surveys have provided some information on early signs of changes to forest ecosystem conditions and will be needed over the long term to understand how climate change is impacting forest dynamics.

More detailed information on forest and tundra vegetation-related climate change impacts, knowledge gaps and research and monitoring requirements is provided in Appendix B.

4.0
Goal #2 – Improve Knowledge of Climate Change Impacts

4.2.1.5 Changes to Wildlife

The NWT is one of the few remaining regions in the world with herds of wild ungulates (e.g. caribou and muskoxen), healthy populations of top predators and rich northern biodiversity. NWT residents, including Indigenous people, rely on wildlife to maintain subsistence lifestyles and cultures. Wildlife population numbers, health, distribution and habitat are affected by warming temperatures, increased variability in precipitation, extreme weather events and increases in wildland fires. Existing wildlife may face competition from new, non-indigenous species moving further north into and throughout the NWT (e.g. white-tailed deer). Climate change may also result in a mismatch between the timing of biological events (e.g. a change in phenology, such as plant flowering and the emergence of insects) and key lifecycle stages of species that depend on those events. Although wildlife have evolved and adapted to a variable climate, when combined with natural fluctuations and other disturbances, the impacts of climate change on most northern species will likely become more severe.

Wildlife Challenges

Climate-related stresses on wildlife can lead to changes in the natural ranges of mammals, birds and insects, establishment of new parasites in wildlife and challenges accessing food sources.

Long-term wildlife monitoring in the NWT is undertaken predominantly by the GNWT, and also by Indigenous and federal governments, wildlife co-management boards, communities, industry and academic institutions. The GNWT addresses the effects of climate change on wildlife at a species level. Knowledge gaps and research and monitoring requirements that need to be addressed include areas and species that may be more vulnerable to the effects of climate change, and monitoring of changes to wildlife health, population numbers and distribution.

Climate change is also a significant threat to several species-at-risk (e.g. boreal caribou, Peary caribou, Dolphin and Union caribou, polar bear, and various bird and plant species). Ongoing monitoring of these and other species-at-risk will be necessary, as their protection is a legislated responsibility through the territorial *Species at Risk (NWT) Act* and federal *Species at Risk Act.*

More detailed information on wildlife related climate change impacts, knowledge gaps and research and monitoring requirements is provided in Appendix B.

4.2.1.6 Changes to Freshwater Fish and Marine Mammals

Freshwater fish and marine mammals are both important ecosystem components and vital country food sources for residents of the NWT. As part of subsistence, commercial and recreational fisheries, fish such as lake trout, Arctic char, lake whitefish, Northern pike, pickerel and burbot are harvested in numerous lakes and rivers across the territory. Marine mammals, such as ringed seal and beluga, are harvested in the Beaufort Sea.

Healthy and abundant freshwater fisheries are critical to sustaining the NWT's economy, as evidenced by an active Great Slave Lake commercial fishery and outfitters that host tourists for recreational and trophy fishing. Climate change can affect fish and marine mammal health, habitat, food sources, growth, spawning and reproduction schedules, prey-predator relationships, distribution and seasonal migration, due to altered water quality and quantity, changes in water temperature, ocean acidification and extreme weather events.

Long-term fish and marine mammal monitoring in the NWT is the jurisdiction of the federal government, and is supported by the GNWT and Indigenous governments, wildlife co-management boards and academic institutions. There are knowledge, research and monitoring gaps that need to be addressed, particularly for species more vulnerable and sensitive to the

effects of climate change. For example, in some areas, non-indigenous species may threaten indigenous species and affect traditional harvests. In addition, invasive species may also become more widely established as a result of human actions associated with climate change. Further, contaminant concentrations in certain fish and marine mammals (e.g. from thawing permafrost or warmer water temperatures) could increase and potentially impact subsistence consumption.

Climate change is also a significant threat to several fish and marine mammal species-at-risk (e.g. grey whale, bull trout and Dolly Varden). Ongoing monitoring of these and other species-at-risk will be necessary as their protection is a legislated responsibility through the *Species at Risk (NWT) Act* and federal *Species at Risk Act*.

More detailed information on fish and marine mammal-related climate change impacts, knowledge gaps, and research and monitoring requirements is provided in Appendix B.

4.2.2 Human Health

The health of NWT residents is integrally linked to the health of water, wildlife, vegetation and air. Climate change-related impacts – such as changing weather, water and ice conditions, increases in wildland fires and associated smoke, increases in invasive species, altered wildlife, fish and marine mammal ranges, increased types and levels of contaminants, and changes in the distribution, prevalence and impact of infectious diseases and parasites – can impact the health and general well-being of NWT residents.

Impacts being observed include those that affect physical human health, such as the risks from possible exposure to Lyme disease as it moves northward, or injuries sustained from falling through unusually thin ice. Negative impacts on food security can result from declines in specific wildlife, fish and marine mammal species, consumption guidelines due to contaminant levels or altered ranges in species distribution, which can lead to decreased harvesting opportunities. Additionally, changes to mental, social and cultural well-being, due to limited ability to travel safely along traditional routes to access these vital country foods and spend time with family and community on the land, can occur as climate change impacts the land and water.

> ***Food security means having reliable access to affordable, sufficient and nutritious food. In the NWT, food security may decrease for Indigenous people who can no longer safely access country food sources due to increasingly unpredictable lake and river ice conditions.***

Long-term monitoring of the health of NWT residents is led predominantly by the GNWT and is also undertaken by Indigenous and federal governments and academic institutions. There are, however, gaps in knowledge, research and monitoring that need to be addressed to better understand the implications for human health, particularly in populations more vulnerable to the effects of climate change, like Indigenous people who depend on the natural environment for their livelihood and sustenance.

More detailed information on human health-related climate change impacts, knowledge gaps, and research and monitoring requirements is provided in Appendix B.

4.2.3 Public Safety

Public safety is a key consideration in the context of climate change. As conditions change, harvesters are experiencing increasing difficulties and taking on greater risks in accessing country foods and pursuing traditional economies and activities, particularly due to changing ice conditions. In communities or built environments, infrastructure may be at risk due to thawing of permafrost, wildland fires or flooding, causing public safety concerns.

4.0
Goal #2 – Improve Knowledge of Climate Change Impacts

The built environment refers to human-made structures, features and facilities that exist within communities, on the landscape and at remote locations.

The monitoring of risks and promotion of emergency preparedness and safety to the public is led predominantly by the GNWT and also undertaken by Indigenous and federal governments and academic institutions. It is therefore important that gaps in knowledge, research and monitoring for these high hazards, as well as other hazards, be addressed, particularly for communities that are increasingly vulnerable to the effects of climate change.

In 2014, the GNWT released the NWT Hazard Identification Risk Assessment Report, which considered climate change impacts when assessing hazards. Floods and wildland fires were deemed very high hazards in the NWT.

More detailed information on public safety-related climate change impacts, knowledge gaps, and research and monitoring requirements is provided in Appendix B.

4.2.4 Culture and Heritage

Culture is the living and evolving expression of values. Heritage encompasses things from the present and the past that people wish to bring to the future. Together, culture and heritage are vitally important to Indigenous people and all residents of the NWT. The numerous climate-related changes occurring on the landscape are a threat to important heritage resources, artifacts and cultural practices. Impacts range from challenges accessing traditional hunting and trapping grounds that lead to decreases in traditional economies (e.g. sale of wild furs), to losses of cultural and heritage resources due to changes in the natural environment, such as coastal erosion, permafrost thaw slumping and wildland fires.

Long-term monitoring of the culture and heritage of NWT residents is led predominantly by the GNWT and also undertaken by Indigenous and federal governments and academic institutions. There are, however, gaps in knowledge, research and monitoring that need to be addressed to ensure that resiliency is strengthened to sustain Indigenous peoples' culture and heritage in light of the effects of climate change.

More detailed information on culture and heritage-related climate change impacts, knowledge gaps, and research and monitoring requirements is provided in Appendix B.

4.2.5 Infrastructure

The NWT's built infrastructure, including buildings, houses, airports, roads, bridges, pipelines, power transmission lines and marine transportation systems, is being impacted by the many alterations to the environment resulting from climatic change, such as permafrost thaw, extreme weather events, increasing snow loads, changing water levels, changing water courses and coastal erosion.

Permafrost thaw and extreme weather events, particularly in northern NWT, has resulted in damage to infrastructure, including buildings, runways and highways.

Thawing permafrost is a significant concern as it underlies much of the NWT's infrastructure, both within communities and on the broader landscape, and can lead to potential adverse impacts on commercial and residential building foundations, damage to runways, highways and bridges, and the possible movement or failure of pipelines and utilidors, resulting in spills. These risks could result in significant infrastructure damage.

Increased snow loads are also a potential issue in relation to the structural integrity of existing, aging buildings whose design and construction is not able to withstand current climate change impacts.

If these facilities are not monitored and assessed regularly, there is a potential for increased snow loads to result in damage and failures on buildings with limited structural capacity.

Reliable permafrost data and analysis is of key importance to designing, building and maintaining infrastructure in the North. Knowledge of ground temperature and permafrost properties is required to ensure the long-term stability of infrastructure is not at risk as the climate changes.

Monitoring of impacts on infrastructure is led predominantly by the GNWT and also undertaken by community, Indigenous and federal governments, industry and academic institutions. There are gaps in knowledge and research and monitoring requirements that need to be addressed, particularly in regions and communities that are more vulnerable to the effects of climate change. Conducting research and monitoring and filling current knowledge gaps on infrastructure will allow for the development of standards, tools and predictive models to adapt and build resilience in the NWT.

More detailed information on climate change impacts to infrastructure, along with knowledge gaps and research and monitoring requirements, is provided in Appendix B.

4.2.6 General Requirements – Linkages and Cumulative Impacts

Sections 4.2.1 to 4.2.5 describe various impacts, knowledge gaps, and research and monitoring requirements related to the natural environment, human health, public safety, culture and heritage, and infrastructure. In addition to these specific impacts and requirements, it is also important to consider related linkages and interconnections to different processes and impacts.

Two general requirements that need to be addressed include:

1. Determining and understanding the feedbacks, linkages and interactions among ecological processes (including terrestrial, aquatic, marine and air) and the effects of climate-related changes; and
2. Determining what the cumulative impacts of all these changes are on human and community health, cultural and heritage resources, and the built environment within the NWT.

The GNWT, Indigenous and federal governments, communities, industry and academic institutions conduct or contribute to a variety of monitoring and research focused on these requirements. For example, the NWT Cumulative Impact Monitoring Program coordinates, conducts and funds the collection, analysis and reporting of information related to environmental conditions in the NWT, using scientific, traditional and local knowledge. This territorial program is guided by a steering committee of Indigenous, territorial and federal government representatives. By furthering an understanding of cumulative impacts, the program aims to support sustainable resource management.

Currently the focus of the program is on caribou, water and fish, and there is an increasing awareness of the climate change-related impacts to these ecosystem components (e.g. habitat suitability, permafrost thaw slumps and wildland fires). As cumulative impact monitoring and assessment continues to evolve in the NWT, the impacts from climate change will continue to be monitored and included in cumulative impacts assessments.

4.0
Goal #2 – Improve Knowledge of Climate Change Impacts

4.3 GOAL #2 – ACTION PLAN RESEARCH AND MONITORING REQUIREMENTS

Research and monitoring requirements to be included in the 2019-2023 Action Plan are highlighted below. A more comprehensive list can be found in Appendix B, which will serve as the basis for the further development of research and monitoring actions in the 2019-2023 Action Plan to improve knowledge of climate change impacts.

Management of Information

- Develop a central repository to share and access climate change knowledge and information.
- Ensure traditional, local and scientific knowledge is gathered and managed appropriately when developing climate change research, monitoring, mitigation and adaptation processes and actions.

Natural Environment

- Enhance the availability of climate and environmental information by providing data, along with products such as summaries of data trends and variability, and projections of future climate.
- Collect and provide permafrost baseline data to support infrastructure planning, community decision-making and ecosystem management.
- Complete vulnerability assessments of aquatic ecosystems at greater risk of climate change impacts, and expand monitoring networks where necessary and possible.
- Complete vulnerability assessments that integrate research, monitoring and traditional knowledge to develop effective adaptation measures for specified forests and tundra areas of value and interest.
- Complete climate change vulnerability assessments for all species-at-risk.
- Further research and monitor country food sources, including their health, abundance and distribution, to determine availability and quality of food sources.

Human Health, Public Safety, and Culture and Heritage

- Complete flood zone and fire risk mapping for vulnerable communities.
- Assess risks to human health arising from air quality issues, floods, increases in invasive species and other climate change impacts.
- Conduct research to understand where heritage resources, such as archeological sites, are at greatest risk of impact due to coastal erosion, thawing permafrost, melting alpine ice and wildland fires.

Infrastructure

- Obtain accurate climate data sets for all regions in the NWT that account for regional variability to inform new infrastructure design and risk assessments for existing infrastructure.
- Develop a climate projection model to use for infrastructure design and risk assessments.
- Understand the vulnerability of existing and future infrastructure.
- Understand how aged infrastructure is responding to the effects of climate change.
- Continue research and development to assist in improving construction standards for different types of infrastructure that take into account a changing climate.

5.0

Goal #3 – Build Resilience And Adapt to a Changing Climate

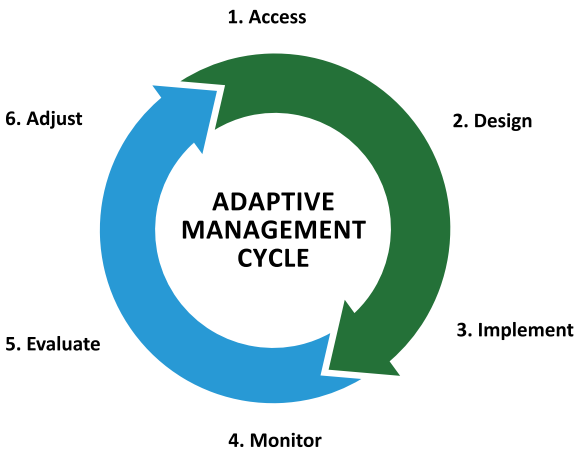
Integrating or "mainstreaming" climate change considerations into plans, policies, operational practices and management functions is vitally important.

As the northern climate continues to change, decision-makers will need to adjust plans and operations to deal with a wide range of possible future conditions and unanticipated events.

To address the degree of uncertainty related to how climate changes may affect the NWT, an adaptive management cycle, as shown on the right, will be implemented so that adjustments can be made as required. This is necessary to ensure current and future climate change considerations are incorporated into management and decision-making.

Efforts to increase resilience and understand the processes of adaptation are required in four broad areas: sustainability of ecosystems; the natural environment and its components; human health, public safety, and culture and heritage; and infrastructure.

5.0 Goal #3 – Build Resilience And Adapt to a Changing Climate



5.1 SUSTAINABILITY OF ECOSYSTEMS

The NWT already has numerous processes and plans in place that govern and support the management of ecosystems and natural resources. Over time, it is anticipated that many of these will need to be updated to better account for climate change-related impacts and opportunities.

Ensuring that ecosystems remain healthy and diverse is a priority for the NWT, as food security and traditional economies rely on the maintenance of biodiversity. There are several integral components that make up the NWT's overall ecosystem and sustainable resource management regime, including conservation network planning through Healthy Land, Healthy People: GNWT Priorities for Advancement of Conservation Network Planning (2016-2021), the GNWT Land Use and Sustainability Framework and regional land use planning. Each contributes to improving ecological, social and economic resilience and adaptation to climate change. Additional information on these contributions is provided in Appendix C.

5.2 NATURAL ENVIRONMENT

As discussed under Goal #2, numerous impacts to the natural environment resulting from climate change have been identified, ranging from gradual shifts in the physical landscape and ecosystems, to increased occurrence of more abrupt extreme events. For many of these impacts, resilience and adaptation measures will be required.

As research and monitoring continues to 2030, important knowledge gaps will be filled to better understand the NWT's natural environment and results will be integrated into climate change planning and adaptation.

5.2.1 Climate and Weather

With more extreme weather conditions and changes in climate over time, the NWT will need to build resilience and work towards adapting to these changes. Key efforts will include enhanced climate monitoring, undertaking vulnerability assessments and using climate modeling to predict future climatic conditions, including extreme weather events. These projections will also be integral to allow for the assessment of new opportunities, such as those resulting from a longer growing season. Current and potential adaptation efforts to address impacts related to climate and weather are provided in Appendix D.

5.2.2 Permafrost

Residents and wildlife will depend on the territory's ability to adapt to changes in permafrost. To support the NWT's efforts in adapting to thawing permafrost conditions due to climate change, improved monitoring and assessment and the fostering of science-based decision-making are needed. Current and potential adaptation efforts to address climate change-related impacts to permafrost are provided in Appendix D.

5.2.3 Water Quality and Quantity

Residents, wildlife and fish will depend on the ability to adapt to changes in water quality and quantity, in all its forms, due to the likely increased frequency of natural events such as wildland fires, permafrost thaw slumps, extreme weather events, frequency and severity of droughts and floods, and increased water temperatures.

The NWT Water Stewardship Strategy's Action Plan 2016-2020 outlines actions that consider the effects of climate change and assess the vulnerability of watersheds to climate change, to ensure the waters of the NWT remain clean, abundant and productive for all time, as per the Strategy's vision. Current and potential adaptation efforts to address climate change impacts to water quality and quantity are provided in Appendix D.

5.2.4 Forest and Tundra Vegetation

Residents and wildlife depend on the NWT's ability to adapt to changes to forests and tundra due to the likely increased frequency of natural events such as wildland fires, droughts, extreme weather events, and insect and disease disturbances.

The effects of climate change on NWT forests and tundra are currently difficult to predict due to knowledge gaps and uncertainties about the extent and direction of changes. Several integrated management approaches to address climate change adaptation need to be employed. Current and potential adaptation efforts to address climate change-related impacts to forest and tundra vegetation are provided in Appendix D.

5.2.5 Wildlife

The NWT's wildlife is typical of arctic and subarctic ecosystems and has adapted to a northern climate. However, with more extreme weather conditions and accelerated changes in climate, it is difficult to predict how wildlife will be able to continually adapt to more frequent wildland fires, changes in water quality and quantity, increased temperatures, landscape changes due to thawing permafrost, changes in species distribution (including invasive species) and potential increases in diseases and parasites.

Maintaining healthy and resilient wildlife populations in the NWT for ongoing biodiversity conservation, to meet food security needs and to preserve traditional economies (e.g. trapping for the harvest of wild furs) is important from an economic and cultural standpoint. Current and potential adaptation efforts to address climate change-related impacts to wildlife are provided in Appendix D.

5.2.6 Freshwater Fish and Marine Mammals

A warming climate is contributing to changing water temperatures, levels, quality and quantity in the NWT, which in turn affects fish and marine mammals. It is important to maintain healthy and resilient fish and marine mammal populations in the territory for ongoing biodiversity, as vital country foods and as valuable sources of income. Current and potential adaptation efforts related to fish and marine mammals are provided in Appendix D.

5.3 HUMAN HEALTH, PUBLIC SAFETY, AND CULTURE AND HERITAGE

Protection of people and culture is of paramount importance. This responsibility is shared by community, Indigenous, territorial and federal governments and NWT residents. As the climate changes, various levels of government must be able to anticipate, address and minimize emerging risks and associated impacts to human health, public safety, and culture and heritage. Climate change is resulting in increased unpredictability in seasonal weather, affecting decision-making in many aspects of northerners' lives, including determining whether or not travelling on the land for subsistence harvesting is safe.

Current and emerging climate change risks and impacts to human health, public safety, and culture and heritage will need to be anticipated and addressed in order to adapt to a changing climate.

NWT communities are generally more vulnerable to climate change effects than southern Canadian communities. This is due to a lack of back-up infrastructure and systems, remoteness, socio-

1485

5.0
Goal #3 – Build Resilience And Adapt to a Changing Climate

economic challenges and limited local capacity. On the other hand, residents of the NWT also have advantages to overcoming impacts from natural hazards or disasters, as they are self-reliant and used to extreme weather conditions and related disruptions. Building resilience and adapting to climate change impacts will be critically important for NWT residents.

5.3.1 Human Health

Health adaptation is action taken by health sector officials, in collaboration with other sectors, to understand, assess, prepare for and help to prevent the health impacts of climate change, particularly on the most vulnerable in society.

In the NWT, current and emerging human health risks resulting from climate change include food safety and security, air quality concerns, exposure to environmental contaminants, spread of infectious diseases and outbreaks, and deterioration of physical and mental health. Current and potential adaptation efforts to address climate change-related impacts to human health are provided in Appendix D.

5.3.2 Public Safety

Abrupt extreme events, such as flooding and wildland fires, may increase in severity and frequency due to climate change and necessitate changes to the NWT's approach to emergency management. The identification of flooding and wildland fires as very high hazards in the 2014 NWT Hazard Identification Risk Assessment Report is a driving factor behind ongoing updates to the NWT Emergency Management System. Numerous other hazards, such as extreme weather (including increasing snow loads), critical infrastructure failure, drought (due to low water levels), human disease and permafrost degradation, along with the level of changing risk, need to be understood and considered to inform adaptation planning. Current and potential adaptation efforts to address climate change-related impacts to public safety are provided in Appendix D.

> ***FireSmart is an initiative that lowers the fire risk around homes and communities by reducing the amount of woody material (e.g. trees, shrubs and leaves) that can burn in a wildland fire.***

5.3.3 Culture and Heritage

Culture and heritage is tied to the land. The GNWT works with communities to preserve, research and showcase culture and heritage for future generations. The effects of climate change create additional urgency and challenges for protecting culturally significant places, preserving heritage objects and records, supporting the preservation of traditional skills and practices, and engaging in culture and heritage research.

The GNWT's Culture and Heritage Strategic Framework (2015-2025) identifies goals and priorities to help protect and support the NWT's rich heritage and diverse cultural practices. of the goals – safeguarding heritage – is particularly relevant in the context of a rapidly warming climate and the numerous changes occurring on the landscape. Current and potential adaptation efforts to address climate change-related impacts to culture and heritage are provided in Appendix D.

5.4 INFRASTRUCTURE

Infrastructure, such as houses, public buildings, roads, airports, marine transportation systems, pipelines, bulk fuel storage tank farms, power generation plants and transmission lines, water sanitation systems and other important facilities that exist within communities, on the landscape and at remote locations, can be referred to as the built environment. These assets provide services as part of daily life, such as transportation, shelter, health, education and other essential services, including economic and social activities.

The need to carefully consider climate change, including impacts on permafrost, when determining suitable sites for buildings and facilities in the NWT is critical. This is highlighted in the GNWT's Good Building Practice for Northern Facilities.

In the NWT, the replacement value for the built environment is roughly estimated to be $8 to $10 billion.

Some of the infrastructure in the NWT is relatively new. However, much of it was designed and built in previous decades based on engineering practices, building codes and standards of the day that did not consider the need to adapt to a changing environment over extended service timelines.

The Standards Council of Canada leads the Northern Infrastructure Standardization Initiative to address unique circumstances in Canada'sNorth, such as its vulnerability to the impacts of climate change, to develop standards for northern infrastructure.

Current critical areas of focus include:

- Moderating the effects of permafrost degradation on existing building foundations;
- Managing changing snow load risks for buildings;
- Community drainage system planning, design and maintenance;
- Planning, design, operation and maintenance of wastewater treatment using lagoon and wetland systems;
- Selection of foundation types and sites for buildings in permafrost;
- Fire resilient building designs and materials;
- Techniques for dealing with high winds for northern infrastructure; and
- Erosion protection in permafrost.

1487

5.0
Goal #3 – Build Resilience And Adapt to a Changing Climate

As the NWT continues to warm and experience significant climate changes (i.e. increasing snow loads, permafrost instability, coastal erosion, potential flooding, increased rainfall and high wind events), two distinct challenges with respect to its built environment have emerged:

1. A need to upgrade some of the aged infrastructure and facilities to handle emerging conditions never contemplated when originally designed and constructed; and
2. A need to establish appropriate design standards and practices when designing and constructing new infrastructure with a service life in excess of 50 years. This is challenging because uncertainty about the range and extent of climate impacts that may occur in future decades creates further uncertainty about appropriate design parameters.

Ongoing monitoring and potential upgrading will occur on an as-required basis for existing infrastructure and facilities. With regards to planning, design and construction of some new institutional buildings, the GNWT and other jurisdictions are moving towards specifying a service life in excess of 40 years. Pile foundation resiliency has been improved by extending foundation pile depths to reach colder and more thaw-stable permafrost soils. These types of changes are the result of incorporating best available knowledge and resilient design standards to adapt to a changing climate.

Adapting the NWT's built environment to be resilient to current and future climate change impacts is a major technical and economic challenge that all levels of government, professional associations, industry and the private sector must work together to address.

While it is a significant challenge, it is not new to the NWT. Professionals such as architects, engineers, capital planners, builders and maintainers are well aware of the challenges and have already been taking steps to address climate change issues for nearly 20 years.

5.4.1 Transportation System

The NWT's transportation system is made up of all-weather roads, seasonal winter roads, airports, rail transportation, ferry crossings and marine transportation systems. Climate-related changes, particularly thawing permafrost, winter ice conditions and variable water levels, are impacting how the transportation system is planned, operated and maintained.

The GNWT has completed a considerable amount of work in recent years to identify emerging issues and potential adaptation actions. Efforts are focused on planning, replacing winter roads with all-season roads and updating aging infrastructure. Current and potential adaptation efforts are provided in Appendix D.

5.4.2 Community and Public Infrastructure

NWT communities are responsible for infrastructure that may be vulnerable to, or affected by, climate change impacts. This includes roads, recreational facilities and other municipal buildings, water supply systems and waste management systems. Current and potential adaptation efforts to help communities address climate change-related impacts affecting infrastructure, such as thawing permafrost, flooding, wildland fire risks and coastal erosion, are provided in Appendix D.

5.4.3 Utilities and Other Infrastructure

Within the NWT, there are different types of linear infrastructure that span the landscape (e.g. telecommunications, power transmission lines and pipelines) or are situated on the landscape (e.g. hydroelectric generating stations, mining, oil and gas facilities, monitoring stations, legacy contaminated sites and drilling mud sumps).

This vital infrastructure is also vulnerable to climate change impacts, particularly risks of wildland fire, thawing permafrost or flooding, depending on where the infrastructure is located. Responsibility for the care and maintenance of such infrastructure lies with the owner (e.g. the GNWT, the federal government or the private sector). Impacts to this infrastructure in

remote parts of the NWT could adversely affect communities, residents and businesses, as well as the natural environment. Therefore, it is necessary to ensure infrastructure is resilient or can be adapted to the effects of a changing climate. Related current and potential adaptation efforts are provided in Appendix D.

5.5 COMMUNITY ADAPTATION PLANNING

Community governments in the NWT are responsible for providing a wide range of programs and services. Adaptation planning and action at a local level is urgently required to help community and Indigenous governments address the impacts of climate change and identify options and opportunities to ensure community well-being. Community governments require support to develop and implement adaptation plans.

Key aspects of community adaptation planning typically include hazard mapping (e.g. flood zone mapping), a thorough evaluation of all community infrastructure, the identification of potential impacts to community health and well-being (e.g. food security), and a review of all municipal policies, plans and operations that may be affected by climate change. As noted in Section 5.3.2, the NWT Hazard Identification Risk Assessment identified numerous hazards that can be strongly affected by climate change that need to be considered by communities.

The following initiatives are aimed at helping communities build resilience and find ways to adapt to the impacts of climate change:

Federal Government Initiatives

- Indigenous and Northern Affairs Canada's Climate Change Preparedness in the North program (2016-2021) helps communities undertake risk and vulnerability assessments, develop hazard maps, identify adaptation options and develop adaptation plans;
- Health Canada's Climate Change and Health Adaptation Program for Northern First Nations and Inuit Communities funds community-led research projects aimed at addressing anticipated health-related impacts of climate change; and
- Public Safety Canada's National Disaster Mitigation Program funds communities to undertake mitigation work (e.g. studies, plans and small projects). While the current program focus is on flood mitigation, it is broadening to include all hazards. A Disaster Mitigation and Adaptation Program focused on large-scale structural mitigation projects is also under development by the federal government.

GNWT Adaptation Initiative

- In 2018-2019, the GNWT will implement a new Community Climate Change Adaptation initiative investing in projects that support community adaptation to climate change impacts. Projects will be completed through partnerships between community, territorial and federal governments, academic institutions, non-government organizations and others.

5.6 COST OF INACTION

Sections 5.1 to 5.4 outline a number of wide-ranging issues and potential responses that the NWT could take to address climate change concerns and opportunities. In the future, all community, Indigenous, territorial and federal governments, businesses, industry, academic institutions, non-government organizations and NWT residents will need to make a number of decisions about their priorities for allocating resources to address the impacts of climate change.

5.0 Goal #3 – Build Resilience And Adapt to a Changing Climate

To inform the NWT's overall efforts to address climate change impacts and opportunities, the GNWT will undertake a comprehensive assessment of the projected economic impacts of climate change in the NWT over the next 20 years. This study will attempt to estimate the overall cost of the combined impacts that may occur due to climate change, if no action is taken. Understanding the cost of inaction is critically important for providing context for funding decisions and resource allocations.

5.7 GOAL #3 – SUMMARY OF EFFORTS REQUIRED TO BUILD RESILIENCE AND ADAPT TO A CHANGING CLIMATE

A summary of efforts with a focus on building resilience and adapting to climate change is highlighted below. A more comprehensive list of current and potential adaptation efforts found in Appendix D will serve as the basis for prioritizing and developing the adaptation actions to be further elaborated upon in the 2019-2023 Action Plan.

Natural Environment

- Incorporate climate change considerations into conservation network planning and the establishment of existing candidate areas as protected areas.
- Undertake flood forecasting for communities at risk.
- Develop predictions on landscape, ecosystem and water quality changes that will likely result from permafrost thaw to inform environmental management and decision-making.
- Increase the resilience of wildlife populations to climate change by mitigating other impacts and stressors.

Human Health, Public Safety, and Culture and Heritage

- Assess the impacts of climate change on health and social services to ensure the capacity needed to withstand cli mate risks and provide essential services, particularly during extreme weather events or situations arising from climate change-related events, is understood.
- Implement a modernized NWT Emergency Plan.
- Improve wildland fire suppression planning and adoption of FireSmart principles in communities.
- Strengthen communities socially and culturally to help build resilience to impacts from climate change.

Infrastructure

- Monitor, inspect and report on existing infrastructure for climate-related impacts.
- Adapt existing infrastructure to climate change impacts through regular maintenance and upgrades.
- Evaluate adaptation efforts to improve resiliency in existing and future infrastructure.

Community Adaptation Planning

- Support community and Indigenous governments in the development and implementation of adaptation plans.

Cost of Inaction

- Undertake a comprehensive assessment of the projected economic impacts of climate change in the NWT over the next 20 years.

6.0

Public Awareness, Capacity Building and Community Involvement

The impacts of climate change represent serious environmental, economic and social challenges for all residents. Outreach and communication activities, along with community involvement, are GNWT priorities that will promote awareness and build capacity to respond to climate change across the NWT. Improving and increasing awareness and capacity building will support the strong partnerships needed to decrease the territory's dependency on fossil fuels and develop the knowledge, tools and measures required to adapt to the changing climate.

6.0 Public Awareness, Capacity Building and Community Involvement

6.1 COMMUNICATION AND OUTREACH

There is a clear need for enhanced knowledge sharing to build awareness about climate change in the NWT, which will require increased access to understandable climate change-related information, like results from research and monitoring on the natural environment, human health, public safety, culture and heritage, and infrastructure. A knowledgeable public will be better equipped to do its part to contribute to territorial efforts on climate change.

As the Framework is implemented, communication and outreach activities will be completed by reaching out to, and working in collaboration with, all levels of government (community, Indigenous, territorial and federal), academic institutions, industry, businesses, non-government organizations and residents, to develop best practices and innovative ways to share knowledge and information. Examples of knowledge sharing mechanisms include websites, webinars, social media, radio, databases, meetings, workshops, public talks, school visits, on-the-land programs and training. Regular, consistent and transparent communication and outreach will provide a way for the GNWT, community and Indigenous governments, and stakeholders to demonstrate accountability through coordinated reporting.

Specific information needs of different regions, community and Indigenous governments, and stakeholders will be solicited by the GNWT as part of the development of the 2019-2023 Action Plan. As different information needs become better understood, the GNWT will develop a central repository to share knowledge and information on climate change.

6.2 COMMUNITY INVOLVEMENT AND CAPACITY BUILDING

The engagement process for the development of the Framework highlighted that community and Indigenous governments want to be more involved in the identification, planning and completion of efforts to address climate change. Because impacts occurring in the NWT are experienced to the greatest extent at the local or regional level, efforts to address such impacts require local leadership and involvement. To ensure they have the capacity to make informed decisions on climate change efforts in a meaningful way, training, research and monitoring must be fully supported to understand and implement climate change actions. It is also important to emphasize that increased capacity is needed at all levels of governments, as well as in academic institutions and other organizations, to realize climate change mitigation and adaptation actions.

A great deal of climate change-related research and monitoring information is being generated. Increasing traditional, local and scientific knowledge capacity will allow for enhanced and more frequent climate change related research and monitoring (See Section 4.1 for more details). This is essential for informing planning and decision-making at the community level, from adaptations that will protect infrastructure from the effects of permafrost thaw, to mapping flood zones and fire risks in vulnerable communities.

Training and education will need to incorporate climate change knowledge, as climate change issues affect all disciplines and areas of society. The demand for training and education in the environmental, human health, public safety, culture and heritage, and infrastructure fields related to climate change is increasing. Coordinated training and educational programs will be required to address the growing list of climate change impacts and future mitigation and adaptation strategies.

Community Workshop Feedback 2017

During the six regional engagement workshops and as part of the public feedback received on the draft Framework, communities made a number of specific requests related to their role in research and monitoring:

- Establish better partnerships between communities and researchers;
- Lead research and monitoring based on local/regional climate change priorities;
- Participate at the outset of research projects to identify community concerns and make sure the intended results address community interests;
- Receive training and support to build community capacity that will allow community residents to participate in and lead research and monitoring work;
- Integrate schools and youth in research and monitoring;
- Increase the use of traditional and local knowledge;
- Improve communications and outreach on findings and trends; and
- Ensure access to climate change knowledge.

6.3 OUTREACH PRIORITIES FOR ACTION PLAN

Priority actions for the 2019-2023 Action Plan that focus on public awareness, capacity building and community involvement are highlighted below and will be elaborated upon in the Action Plan.

Communication and Outreach

- Develop an outreach and communication plan to support the Framework's vision and goals.
- Develop accessible tools and resources (e.g. community permafrost maps) for use by community and Indigenous governments.
- Work with GNWT staff to incorporate climate change into existing and future outreach programming.

Community Involvement and Capacity Building

- Implement coordinated training and educational programs to address the growing list of climate change impacts and future mitigation and adaptation actions.
- Enhance community-based capacity to monitor and assess climate change impacts and inform necessary adaptations.
- Increase capacity at all levels of government (community, Indigenous, territorial and federal) to undertake climate change mitigation and adaptation actions.

7.0
Economic Development Opportunities

While the NWT is facing many risks and vulnerabilities due to a changing climate, there may also be opportunities that could result in economic benefits.

7.0 Economic Development Opportunities

Some of the actions the NWT must implement to reduce GHG emissions have tangible economic benefits. Examples include:

- *Energy Efficiency and Renewable Energy Projects:* Retrofitting existing homes and buildings or installing local biomass and renewable energy projects helps to stimulate local economies through the purchase of equipment, building materials and the hiring of engineers, contractors and skilled labour;
- *Biomass Supply:* Continuing to increase the use of biomass energy for space heating and, potentially, power generation will increase the demand for biomass supplies in NWT communities. The harvesting, storage and distribution of biomass (cordwood and pellets) provides local business and employment opportunities;
- *Hydroelectric Projects and/or Transmission Lines:* Such projects are capital-intensive and require professional support at all stages, including planning, design, permitting, construction, operation and maintenance;
- *Resource Development Projects:* Finding ways to reduce fossil fuel consumption at remote sites can help reduce GHG emissions and energy costs, which can in turn lower overall operating costs and improve the economic viability of resource development projects;
- *Local Natural Gas Supply:* The development of locally available natural gas resources for power generation and space heating may offer a lower-cost and lower-emissions alternative to importing diesel fuel and natural gas from southern Canada;
- *Knowledge Economy:* The climate change challenges that need to be addressed represent opportunities for research, development and innovation. Identifying and implementing practical adaptive measures for communities and industry will contribute to the NWT's knowledge economy. It may also be possible to generate economic opportunities emerging from the NWT's collective experience in building resilience and adapting to climate change; and
- *Agriculture:* Building a relevant and viable agricultural industry and contributing to the sustainability of NWT communities are goals of the territory's first agriculture strategy, The Business of Food: A Food Production Plan 2017-2022. As growing seasons lengthen, producing more food locally can begin to address food security concerns, reduce food costs for residents and decrease GHG emissions resulting from the transportation of food from the south.

As more information becomes available on climate projections, assessments of new opportunities will be conducted in these, and potentially other, sectors.

1495

8.0 Implementation

Photo: Natural Resources Canada

To achieve the Framework's three goals by 2030, the GNWT, in collaboration with community and Indigenous governments and key stakeholders, will develop and implement two Action Plans – the 2019-2023 Action Plan and 2025-2029 Action Plan – which will be reviewed yearly, as well as comprehensively every five years. Shared responsibility and strong partnerships will be critical to the successful implementation of the Action Plans. Governance and coordination structures will be established to strengthen collaborative working relationships within the GNWT and with community, Indigenous and federal governments, industry, non-government organizations and other stakeholders. Ongoing tracking, annual reporting and formal evaluations will ensure the Action Plans and the Framework can be adapted, as required.

8.0 Implementation

8.1 SHARED RESPONSIBILITY AND PARTNERSHIPS

The Pan-Canadian Framework on Clean Growth and Climate Change is Canada's collective plan to address climate change and grow a clean economy. The Pan-Canadian Framework provides broad direction and guidance that is relevant to the development and implementation of the NWT's Framework.

The Government of Canada is implementing several significant funding programs and initiatives to support the four main focus areas of the Pan-Canadian Framework. The GNWT will work closely with the federal government, community and Indigenous governments, and stakeholders to deliver specific funding programs and initiatives of particular interest to the NWT, including:

- *Low Carbon Economy Fund* – will support a variety of actions to reduce GHG emissions;
- *Green Infrastructure Fund* – will support projects involving GHG emissions reductions, along with clean water, wastewater and electricity systems;
- *Arctic Energy Fund* – will focus on addressing energy security for communities north of the 60th Parallel;
- *Resilience and Adaptation Measures* – will support Indigenous and northern communities' use of traditional knowledge to understand and prepare for climate change, improve emergency management and enhance resilience in northern communities; and
- *Canadian Centre for Climate Services* – this newly-created organization will focus on supporting the provision of climate-related training, data, information and tools to support adaptation decision-making and climate resiliency.

As information on the various funding opportunities becomes available, the GNWT will work collaboratively with community and Indigenous governments, non-government organizations and the private sector to identify and scope out potential projects and actions that can be supported using federal funds. Collaborations will lead to the strong partnerships necessary to adapt to climate change impacts well into the future.

8.2 2019-2023 ACTION PLAN AND FRAMEWORK RENEWAL

The GNWT recognizes that climate change is an urgent concern and that there are numerous programs and initiatives already underway, or required, at the community, regional and territorial levels that rely on the involvement and support of community, Indigenous and federal governments and stakeholders.

To manage the work that will be funded through various programs and initiatives, and to report on progress, the GNWT will lead the development of a comprehensive 2019-2023 Action Plan.

8.2.1 2019-2023 Action Plan

The goals, knowledge requirements, adaptation efforts and other action items described in this Framework are the basis for the 2019-2023 Action Plan.

The process for developing and implementing the Action Plan will include additional engagement to identify research and monitoring requirements and current and potential adaptation efforts (preliminary lists are provided in Appendices B and D). For each identified action, efforts will be made to determine key partners, estimated costs, available resources, expected timelines and anticipated results.

Engagement on the development of the 2019-2023 Action Plan will be undertaken with:

- GNWT departments and agencies;
- Indigenous governments and organizations;
- Community governments and other local organizations;
- Regulatory and resource management boards;
- Non-government organizations; and
- Industry, the private sector and the public.

8.0 Implementation

The GNWT is committed to developing the 2019-2023 Action Plan before the end of 2018. Once finalized, key elements of the 2019-2023 Action Plan will include:

- A summary of the roles and responsibilities of all community, Indigenous, territorial and federal governments, organizations, industry and others involved in climate change emissions mitigation and adaptation;
- A comprehensive list of current and potential actions, organized by goals and priorities;
- An estimate of the annual funding available and resources needed to implement the identified actions;
- Direction on how overall collaboration, coordination and communication on climate change activities can be improved; and
- Details on key indicators to be used to measure progress and report annually.

8.2.2 Framework Implementation and Renewal

The following is a general planning timeline for the implementation of the Framework and development of Action Plans from 2018 to 2030, based on an adaptive management approach:

2018:	Develop a comprehensive 2019-2023 Action Plan for the NWT
2019-2023:	Implement the 2019-2023 Action Plan, and track and report on results annually
2024:	Complete a formal independent review of the Framework and 2019-2023 Action Plan. Any revisions to the Framework and the development of a new Action Plan for 2025 to 2029 will be based on the results of the 2024 Evaluation Plan review along with emerging issues and new opportunities, technologies and information
2025-2029:	Implement the 2025-2029 Action Plan, and track and report on results annually
2030:	Conduct a second independent review of the Framework and 2025-2029 Action Plan and use the results to update and renew accordingly

8.3 GOVERNANCE AND COORDINATION

The GNWT recognizes that it needs to play a leadership role in the governance and coordination of all the priorities, knowledge requirements, adaptation efforts and other actions contained in the Framework.

Within the GNWT, three different committees are in place to support the overall governance and coordination of climate change-related programs and projects across departments and manage linkages with other relevant initiatives, such as the 2030 Energy Strategy. These are:

- Assistant Deputy Minister Energy and Climate Change Committee
- Deputy Minister Energy and Climate Change Committee
- Energy and Climate Change Committee of Cabinet

The Department of Environment and Natural Resources (ENR) serves as the lead GNWT department for climate change. ENR fulfills several roles that support information-sharing and coordination of climate change efforts within the NWT, including:

- Tracking and reporting on GHG emissions and the NWT's progress on climate change resiliency and adaptation;
- Identifying emerging issues;
- Sharing information on climate change trends and topics;
- Providing technical expertise;
- Building partnerships (within the GNWT and externally) to support cross-cutting initiatives;
- Distributing adaptation funding; and
- Representing the NWT at national and international meetings and forums.

One recommendation from the Office of the Auditor General report, *Climate Change in the Northwest Territories*, focused on the need for ENR to provide stronger leadership and communication within the NWT on climate change.

To respond, ENR will:

- Establish a GNWT Working Group including membership from each department at a Director level. ENR and the Department of Infrastructure will serve as co-chairs and provide leadership and secretariat support. This working group will focus on government efforts to implement and report on the Framework and Action Plans. The GNWT Working Group will report to the Assistant Deputy Minister Energy and Climate Change Committee.
- Explore mechanisms to improve coordination and communication with community and Indigenous governments, industry, the NWT Association of Communities, non-government organizations, stakeholders and the public. Ensuring mechanisms are in place to provide input into the implementation of the Framework and Action Plan will support the identification of needs and interests; confirm priorities, knowledge requirements, adaptation efforts and other actions; provide guidance on program or project development; and support communications and capacity building.

8.4 FINANCIAL AND RESOURCES

As noted in Section 8.2.1, the development of the 2019-2023 Action Plan will determine the costs and funding requirements, including resources required for actions. As part of this process, existing programs and funding will be examined to determine where additional support, capacity and collaboration are required.

With this information in hand, the GNWT will be in a position to consider what level of funding support may be available from the Government of Canada, and other potential sources, to support the Action Plan. Forming partnerships and collaborations will be necessary to ensure adequate resources to implement the Action Plan.

8.5 TRACKING AND REPORTING

Each year, the GNWT will produce and distribute an annual report on the progress made to address climate change. Each annual report will summarize activities and accomplishments, report on outputs and outcomes, and identify challenges and options to overcome them.

The annual reports will communicate Framework and Action Plan successes to community and Indigenous governments, GNWT departments, Members of the Legislative Assembly, the GNWT Financial Management Board Secretariat and stakeholders, including industry, non-government organizations and the general public. Information and results contained in the annual reports will enable adjustments to be made to the Action Plan and support the evaluation of the Framework in 2024.

A template for the annual report will be developed in 2018 in tandem with the development of the 2019-2023 Action Plan and the 2024 Evaluation Plan.

1499

9.0
Looking Forward

The NWT's climate is expected to continue to change in the coming decades. This trend will continue to influence and change ecosystems, wildlife, water, infrastructure, human health, public safety, and culture and heritage in the NWT. Residents and communities need to prepare for these changes by undertaking mitigation actions, building resilience and finding ways to adapt, when necessary.

9.0 Looking Forward

The Framework will guide the implementation of the 2019-2023 Action Plan, setting the stage for the NWT to respond to the challenges and opportunities associated with climate change, move towards a lower-carbon economy and do its part to contribute to national and international efforts on climate change.

Despite its small population, the NWT has the potential to leverage emissions reductions nationally and internationally as an advocate for the magnitude of climate change impacts felt in the North. Even though the NWT is a small jurisdiction, by broadly sharing its powerful accounts of climate change impacts – and the challenges faced in mitigating and adapting to these impacts – it could strongly influence global action on climate change.

Collaborative efforts and partnerships will be the key to achieving the vision and goals outlined in the Framework by 2030. Community, Indigenous, territorial and federal governments, industry, businesses, academic institutions, regulatory and resource management boards, non-government organizations and residents all have a vital role in reducing GHG emissions and adapting to current and future changes.

The 2030 Energy Strategy is the primary mechanism for GHG reduction from energy in the NWT. The Three Year Energy Action Plan (2018-2021) will set out investments in actions and initiatives to improve energy efficiency and reduce emissions from electricity generation, transportation, space heating and industry. Together, GHG reductions achieved through the 2030 Energy Strategy and Energy Action Plan, carbon pricing and efforts from industry will put the NWT on a solid path to meeting its 30% reduction target for GHG emissions by 2030 (compared to 2005 levels).

The priorities, knowledge requirements, adaptation efforts and other actions outlined in the Framework will serve as the basis for developing and subsequently implementing the 2019-2023 Action Plan. As it is implemented, annual reports will be produced to track progress. Following a review and evaluation of the 2019-2023 Action Plan, a second Action Plan (2025-2029) will be developed and implemented.

By working together, we can address climate change and ensure a safe and prosperous future for the NWT.

1501

APPENDIX A

Department of Environment and Natural Resources and Department of Infrastructure Responses to the Auditor General of Canada Report, Climate Change in the Northwest Territories

The Government of the Northwest Territories (GNWT) Department of Environment and Natural Resources (ENR) and Department of Infrastructure (INF) committed to addressing recommendations outlined in the Office of the Auditor General of Canada's October 2017 report, *Climate Change in the Northwest Territories*.

As outlined below, in releasing the 2030 NWT Climate Change Strategic Framework (the Framework), ENR has taken a significant step towards fulfilling this commitment, with remaining portions of the six recommendations to be fully addressed in the 2019-2023 Action Plan.

Auditor General of Canada Recommendations	Additions to the 2030 NWT Climate Change Strategic Framework
1. ENR should develop and implement a strategy outlining how the NWT will adapt to climate change, including: a territory-wide assessment of climate change risks; input from GNWT departments and residents; taking into account regional diversity, current adaptation efforts and existing knowledge of climate change impacts; and a clear implementation plan with indicators to track adaptation progress, and provision for ongoing assessment and updates as adaptation needs evolve.	ENR has developed the Framework to outline its approach to climate change adaptation. The following responses to the Auditor General's recommendation are reflected in the Framework. Specifically: • Section 4.3 highlights several action plan requirements focused on addressing research and monitoring gaps, and Section 5.7 highlights requirements to be included in the Action Plan focused on addressing current and potential adaptation efforts. These requirements center on the assessment of climate change risk on the natural environment, human health, public safety, culture and heritage, and infrastructure. These, and other potential actions, are reflected in Appendices B and D, respectively, and will be elaborated upon in the 2019-2023 Action Plan and subsequent 2025-2029 Action Plan. • Section 2.1 highlights the extensive engagement carried out to develop the Framework (see Recommendation 4 below). • Section 6.1 notes that different regions will have different information needs, reflecting regional diversity. • Existing knowledge of climate change impacts (Section 4 and Appendix B) and current adaptations needs (Section 5 and Appendix D) are described throughout the Framework. • Section 8.2.2 lays out the implementation plan for the Framework and Section 8.5 highlights the tracking and reporting that will be required annually as the Action Plans are implemented. Annual review and formal evaluations every five years will provide for ongoing assessment and updates as adaptation needs evolve. Section 8.2.1 states the 2019-2023 Action Plan will include details on key indicators to be used to measure progress and report on annually.

Auditor General of Canada Recommendations	Additions to the 2030 NWT Climate Change Strategic Framework
2. To better support climate change information needs and adaptation decisions, ENR should: identify the climate change information needs of GNWT departments and communities; provide departments and others with access to relevant information to support informed adaptation decisions; and monitor implementation of the GNWT Knowledge Agenda.	ENR recognizes the importance of identifying climate change needs and access to information to support adaptation decisions. Specifically: • Section 4.1.3 has been drafted to address the management of traditional, local and scientific knowledge information. The need to improve the capacity to manage information and be able to use the knowledge generated for decision-making is stressed. • Section 4.3 highlights the development of a central repository to share and access climate change knowledge and information as a 2019-2023 Action Plan requirement. • Section 4.3 highlights the need to gather, include and manage traditional, local and scientific knowledge appropriately when developing climate change research, monitoring, mitigation and adaptation processes and actions, as a 2019-2023 Action Plan requirement. • Section 4.1.1 discusses the GNWT Knowledge Agenda, the need to consider climate change impacts across all themes, and the importance of transferring resulting knowledge to the public. • Section 8.1 highlights the collaboration and partnerships with community, Indigenous, territorial and federal governments required to develop and implement the 2019-2023 Action Plan. Strengthening ongoing partnerships with federal departments will also be critical to delivering specific funding programs and initiatives to mitigate and adapt to climate change.

APPENDIX A

Department of Environment and Natural Resources and Department of Infrastructure Responses to the Auditor General of Canada Report, Climate Change in the Northwest Territories

Auditor General of Canada Recommendations	Additions to the 2030 NWT Climate Change Strategic Framework
3. ENR should develop a new greenhouse gas (GHG) strategy for the NWT that includes: concrete actions for addressing GHG emissions, how the actions will address emissions and the specific steps for their implementation; and actively monitor the commitments in its new GHG strategy and publicly report on progress made and results achieved on an ongoing basis.	The following responses to the Auditor General's recommendation are reflected in the Framework. Specifically: • Section 1.4 and Section 1.5 detail the relationship between the Framework and the 2030 Energy Strategy, stating the 2030 Energy Strategy is the primary mechanism for reducing GHG emissions related to energy supply and consumption. The associated Three Year Energy Action Plan (2018-2021) describes the actions and investments required to meet the NWT's GHG emission targets. • Section 3.3 reflects actions for reducing GHG emissions in the NWT that are outside the scope of the 2030 Energy Strategy. Concrete actions and specific steps for implementation will be elaborated upon in the 2019-2023 and 2025-2029 Action Plans. • Sections 8.2.1 and 8.5 highlight that annual progress measuring and reporting on Action Plans will be undertaken and publicly released, and that a template for the annual report will be developed in tandem with the 2019-2023 Action Plan.
4. In developing and implementing its strategy, ENR should engage with stakeholders, including industry, to clearly identify commitments to address GHG emissions in each sector across the NWT.	ENR has engaged extensively with community and Indigenous governments, community organizations, industry, non-government organizations, other interested groups and the public on the development of the Framework. Specifically: • Section 2.1 outlines the areas for which key input was received during regional engagement workshops, a public survey, written submissions and public feedback on the draft Framework. These were reflected in the Framework. • Section 8.2.1 highlights the engagement with all interested community and Indigenous governments and stakeholders that will be required to develop and implement the 2019-2023 and 2025-2029 Action Plans.

APPENDIX A

Department of Environment and Natural Resources and Department of Infrastructure Responses to the Auditor General of Canada Report, Climate Change in the Northwest Territories

Auditor General of Canada Recommendations	Additions to the 2030 NWT Climate Change Strategic Framework
5. ENR should consider options for how best to fulfill its responsibilities as the lead for climate change in the GNWT, including: considering what authority is needed; and identifying the resources needed to fulfill its responsibilities.	ENR is committed to continuing to make improvements to support its leadership role on climate change, as reflected in the Framework. Specifically: • Section 8.3 highlights that ENR is the lead GNWT department for climate change, and lists several roles that it undertakes. To help support a leadership role, the establishment of a GNWT Working Group has been proposed. The Working Group will focus on government efforts to implement and report on the Framework and subsequent action plans. ENR will also explore mechanisms to improve coordination and communication with community and Indigenous governments, industry, the NWT Association of Communities, non-government organizations, stakeholders and the public, to support the implementation of the Framework and Action Plans. As the 2019-2023 Action Plan is developed, ENR will continue to review its authority, roles and responsibilities, and the resources required to effectively implement the Framework.

1505

APPENDIX A

Department of Environment and Natural Resources and Department of Infrastructure Responses to the Auditor General of Canada Report, Climate Change in the Northwest Territories

Auditor General of Canada Recommendations	Additions to the 2030 NWT Climate Change Strategic Framework
6. ENR should identify and implement wildlife management actions to adequately adapt to climate change, including: conducting an assessment of risk for its overall wildlife management strategy to ensure all climate change risks to wildlife have been identified; collecting information to understand impacts on wildlife; taking action to address the risks identified; and working to fulfill existing commitments to address climate change impacts on wildlife.	ENR recognizes climate change as an important factor affecting the NWT's wildlife, as reflected throughout the Framework. Specifically: • Section 4.2.1 states the GNWT generally addresses the effects of climate change on wildlife at a species level. Under this approach, all factors that affect a species, including climate change, are considered in order to assess their cumulative impact on the health and resilience of species. • Section 4.3 highlights the completion of climate change vulnerability assessments for all species-at-risk as an Action Plan priority to better understand climate change impacts on individual species and inform wildlife management decisions and actions. • Numerous climate change research and monitoring requirements (Appendix B) and current and potential adaptation efforts (Appendix D) that collect information on impacts to wildlife, take action to address identified risks, and work to fulfill existing initiatives to address climate change impacts on wildlife are listed in the Framework and will be implemented through the Action Plans.

APPENDIX A

Department of Environment and Natural Resources and Department of Infrastructure Responses to the Auditor General of Canada Report, Climate Change in the Northwest Territories

INF has committed to the following actions to address the Office of the Auditor General of Canada recommendations on assessments, research, inspections, monitoring and reporting on climate change for key infrastructure, which are summarized below.

Auditor General of Canada Recommendations	Department of Infrastructure Responses

1. INF should consistently carry out those operational practices that it committed to in order to manage the impacts of climate change on roads, in particular for the management of small culverts and ice roads.	• INF will reinforce the current inspection system to include minor infrastructure (small culverts and ice crossings);
	• INF will implement an integrated system (including the Bridge Management System, Highway Surface Management System, webworks and highways inspections reports);
	  • The generation of monthly reports to measure performance with semi-annual summaries;
	  • Missing inspections flagged monthly; and
	  • Follow-up action reported and prioritized monthly.
	• INF will conduct a major risk assessment on transportation infrastructure in the presence of climate change, updating the 2013 version and again every two years based on current weather predictions; and
	• INF will continue to work with other jurisdictions to lead and reinforce research and development in infrastructure and climate change, reinforcing the current research and development sites on Highway 3 and Highway 10.

1507

APPENDIX A

Department of Environment and Natural Resources and Department of Infrastructure Responses to the Auditor General of Canada Report, Climate Change in the Northwest Territories

Auditor General of Canada Recommendations	Department of Infrastructure Responses

2. INF should consistently carry out those operational practices that it committed to in order to manage the impacts of climate change on public buildings.	• INF will reinforce the current inspection system for buildings as follows:
	  • Integrate our systems for inspections, monitoring and responses to climate change risks from snow loads, wind loads, permafrost degradation of foundation system s including adfreeze steel and timber piles, thermosyphons and other types of foundations within the maintenance management system;
	  • The generation of regular monthly reports to measure performance with semi-annual summaries;
	  • Missing inspections flagged monthly; and
	  • Follow-up action reported and prioritized monthly.
	• INF will conduct a major risk assessment on the public infrastructure in the presence of climate change, updating the 2004 version and updating/reviewing every two years; and
	• INF will continue working with other northern jurisdictions to lead and reinforce research and development in climate change adaptation for infrastructure and permafrost.

APPENDIX B

Climate Change Impacts, Knowledge Gaps, and Research and Monitoring Requirements

To improve knowledge of climate change impacts, as per Goal #2 of the 2030 NWT Climate Change Strategic Framework, the specific impacts of climate change on the natural environment, human health, public safety, culture and heritage, and infrastructure must be documented to highlight knowledge gaps and determine future research and monitoring requirements.

Impacts of rising temperatures, changing ice cover duration, coastal erosion, thawing permafrost and extreme weather events are easier to measure than impacts to biology, ecology and productivity. The latter impacts tend to be indirect (i.e. seen in secondary factors), take longer to occur and can be the result of many interacting factors, including climate change. All of these factors need to be considered when implementing Goal #2.

The table below outlines important climate change impacts, knowledge gaps and research and monitoring requirements for the natural environment, human health, public safety, culture and heritage, and infrastructure. These knowledge gaps and research and monitoring requirements will help inform the development of the 2019-2023 Action Plan, as well as the Action Plan for the GNWT Knowledge Agenda.

CLIMATE CHANGE IMPACTS, KNOWLEDGE GAPS, AND RESEARCH AND MONITORING REQUIREMENTS

Overarching	To address climate change impacts, knowledge gaps, and research and monitoring requirements on the natural environment, human health, public safety, culture and heritage, and infrastructure, it will be necessary to develop NWT-based capacity. Building capacity will increase the NWT's overall ability to fill the gaps and partner in a meaningful way with funding agencies, as well as formulate important partnerships with community, Indigenous, territorial and federal governments, academic institutions and other organizations to undertake necessary climate change research and monitoring.

1509

APPENDIX B

Climate Change Impacts, Knowledge Gaps, and Research and Monitoring Requirements

Natural Environment	
Changes to Climate and Weather	**Impacts:** • Storms are becoming more severe; • Precipitation is increasingly unpredictable; • Winter freeze-up dates are occurring later, and spring thaw is occurring earlier; • Extreme events, such as drought, are more frequent; and • Increasing snow loads can lead to increased spring run-off and flood risks, as well as impede the movement of people and wildlife on the land. **Knowledge Gaps and Research and Monitoring Requirements:** • Improving the existing monitoring network by increasing the number of stations, particularly in areas more vulnerable to the effects of climate change; • Increasing snow monitoring and winter climate monitoring; • Improving knowledge of extreme climatic events; • Improving knowledge of climate-induced sea level rise on coastal erosion; • Coordinating monitoring efforts between territorial, federal and other partners; and • Collecting and managing data to be easily compared and readily accessible to inform decision-making.

Natural Environment	
Thawing Permafrost	**Impacts:** • Thawing permafrost can result in coastal and shoreline erosion, ground subsidence, landslides, thaw slumps and landscape change; • The structural integrity of much of the NWT's built environment, which relies on frozen ground as a foundation, will be increasingly vulnerable in future decades. The cost of maintaining infrastructure and mitigating impacts can be expected to increase significantly with the acceleration of climate-driven permafrost thaw; • Water quality can be greatly impacted by thawing permafrost as sediment, soluble materials (including metals) and organic carbon are released into nearby water bodies, potentially affecting the surrounding ecosystem and traditional uses; • Thawing permafrost can transform landscapes and overlying ecosystems, most notably in expansive peat plateau woodlands, which are converted to wetlands or fens following thaw. Thaw slumping and transfer of large volumes of sediments downslope is reconfiguring landscapes across the northwestern NWT. Downstream effects may include shifts in water quality and changes in aquatic ecology; • Legacy contaminated sites, drilling mud sumps, tailings and impoundment structures (including waste water lagoons) that utilize permafrost as a containment medium will be increasingly at risk with climate-driven permafrost thaw; and • Preservation of cultural heritage is at risk as thawing permafrost affects heritage resources and culturally significant sites, particularly near coasts and shorelines.

1511

APPENDIX B

Climate Change Impacts, Knowledge Gaps, and Research and Monitoring Requirements

Natural Environment	
Thawing Permafrost continued	**Knowledge Gaps and Research and Monitoring Requirements:** • Collecting and providing permafrost baseline data to support infrastructure planning, community decision-making and ecosystem management; • Further developing a permafrost monitoring network that integrates new data collection and management methods, modeling and remote sensing; • Developing a database of likely landscape, ecosystem and water quality changes resulting from permafrost thaw to inform environmental management and decision making; • Developing a permafrost data management system to manage GNWT and partner generated information, and the capacity to support the system; • Supporting mapping initiatives, modeling and monitoring that can evaluate landscape and ecosystem change and geohazards (e.g. coastal erosion and vertical land movement along the coast); • Developing requirements to ensure the consideration of permafrost thaw in all development and adaptation planning for NWT infrastructure; and • Developing key research topics and climate change research corridors (e.g. Dempster Highway and the new Highway 10 from Inuvik to Tuktoyaktuk) to guide internal and external research efforts to meet NWT needs.

Natural Environment	
Changes to Water Quality and Quantity	**Impacts:** • Water quality can change as water chemistry is altered due to the release of nutrients, metals and other contaminants resulting from wildland fires, erosion and permafrost thaw; • Changes in water quality can affect drinking water sources and harvesting practices; • Changes in water quantity can lead to low water levels in some areas, which can impact wetlands, fishing areas and marine transportation; • Changes in water quantity can lead to flooding in some areas, which can affect the safety and well-being of residents, as well as surrounding ecosystems; • Increases in groundwater flow due to thawing permafrost in certain regions can lead to increased winter flow and changes in water chemistry, while other locations may experience drainage of surface water into the ground; • Reduced ice coverage, duration and thickness on many lakes and rivers can affect the viability of winter roads and traditional harvesting practices; and • Changes in water quality and quantity can impact the aquatic ecosystem as a whole, including invertebrates, which form a critical part of the food chain. **Knowledge Gaps and Research and Monitoring Requirements:** • Expanding water quality and quantity monitoring in areas more vulnerable to the effects of climate change; • Continuing ongoing water monitoring, including community-based monitoring by Indigenous governments and organizations, to answer community questions and determine if stressors such as climate change are affecting water; • Considering climate change in ongoing community source water protection planning; • Determining appropriate biological indicators for aquatic ecosystem health monitoring to provide early warnings of changes that may be related to climate change;

APPENDIX B

Climate Change Impacts, Knowledge Gaps, and Research and Monitoring Requirements

Natural Environment	
Changes to Water Quality and Quantity continued	**Knowledge Gaps and Research and Monitoring Requirements** (continued)**:** • Completing vulnerability assessments for aquatic ecosystems at greater risk of climate change impacts, and expanding monitoring as necessary; • Assessing the cumulative impacts to water from multiple stressors, including climate change, as reflected in the NWT Water Stewardship Strategy Action Plan 2016-2020; • Understanding impacts of climate change on water quality and quantity for mining, oil and gas, hydroelectric and other developments; • Understanding impacts of climate change on water quality and quantity for legacy contaminated sites or industrial developments undergoing reclamation, as certain site management approaches are based on temperatures remaining cold enough (e.g. frozen core dams), or water levels and/or quality remaining relatively constant; • Understanding the implications of flooding on communities and aquatic ecosystems; • Understanding the impacts of thawing permafrost on near-surface groundwater quantity and quality; • Ongoing monitoring of water quantity, snow and ice conditions to provide important planning information for marine transport (river and lake barges), land transport (all-season and winter roads) and for residents undertaking traditional and recreational activities on the land and water; • Understanding climate change impacts on wetlands (remote sensing can be used to provide a baseline for assessing changes to wetlands); • Understanding the important role of wetlands in storing carbon (as carbon dioxide), while also determining the significance of methane release; • Understanding the potential impacts of GHG release from lakes and rivers; and • Determining how the NWT and neighbouring jurisdictions can account for the effects of climate change in setting and monitoring transboundary objectives and conducting research and monitoring as part of current and future transboundary bilateral water management agreements.

Natural Environment	
Changes to Forests and Tundra Vegetation	**Impacts:** • Forest ecosystems in the NWT have been experiencing unprecedented changes in natural disturbance regimes, particularly in the last 10 years, likely due to changing climate. Warming temperatures, changing precipitation patterns, flooding and thawing permafrost are all factors impacting forests; • Changes in natural disturbance regimes and weather patterns are affecting forest productivity, composition and distribution, increasing the frequency and severity of wildland fires, and increasing the prevalence of insect and disease disturbances; • Changes in wildland fire regimes are creating challenges for fire management and community protection, in addition to impacting water, permafrost, wildlife and traditional activities; • Changes in forest insect and disease regimes, such as northern shifts in pest ranges, changes in pest behaviour and increased occurrence of non-indigenous and invasive species (e.g. alfalfa), are causing damage to previously unaffected forest ecosystems; • Changes in tundra vegetation include an increase in shrubs observed near the tree line and the tundra becoming greener, with more growth in vascular vegetation (green leaf plants) but less growth in lichen-dominated areas; and • Drying of tundra vegetation is occurring due to longer warm periods, increasing the risk of tundra fires that can, in turn, leave the surfaces of pingos (unique permafrost formations) vulnerable to erosion. **Knowledge Gaps and Research and Monitoring Requirements:** • Completing vulnerability assessments that integrate research, monitoring and traditional knowledge to develop effective adaptation measures in specified forest and tundra areas of interest; • Understanding the changing wildland fire regime and potential implications for NWT residents and communities; • Understanding forest and tundra vegetation renewal and growth dynamics after natural and human-caused disturbances in a changing climate;

APPENDIX B

Climate Change Impacts, Knowledge Gaps, and Research and Monitoring Requirements

Natural Environment	
Changes to Forests and Tundra Vegetation continued	**Knowledge Gaps and Research and Monitoring Requirements** (continued)**:** • Understanding carbon storage and fluxes in vegetation, soil, wetlands and peat; • Enhanced monitoring of changes in forest productivity, condition and carbon dynamics as climate change progresses (e.g. annual forest health surveys and network of permanent sample plots); • Mapping permafrost extent and characteristics in forested ecosystems to help understand the implications of permafrost thaw; • Enhanced monitoring of changes in tundra vegetation condition as climate change progresses; • Utilizing remote sensing techniques to assist with informed decision-making across the NWT's vegetated land mass; • Creating a baseline vegetation classification scheme for the entire NWT (including forested, tundra and wetland areas); • Completing forest inventories to provide detailed information on vegetation composition and structure at specific areas/times to serve as a baseline for key conditions that can be measured against as climate change progresses; • Assessing long-term impacts resulting from range shifts of domestic pests and presence of invasive and non-indigenous plant and wildlife species; and • Enhancing trials where tree species from different locations are planted at new locations and their growth monitored in relation to the climate.

Natural Environment	
Changes to Wildlife	**Impacts:** • New, non-indigenous species are moving northward into the NWT as the climate continues to warm. Other species are experiencing changes in their ranges within the NWT and some have more limited ranges; • Changes in migrations and movements of wildlife due to extreme weather events or wildland fires are apparent; • New diseases and parasites have been observed that might become established in resident wildlife species; • Changes in the types and distribution of wildlife parasites as well as the frequency, intensity and rate of development of infections are a concern, as wildlife parasites are strongly influenced by relatively subtle changes in climate. There is also evidence that host-pathogen interactions for species already present in the NWT are changing in such a way that may lead to unprecedented host population declines; • Shifting of the timing of insect hatch has resulted in some bird species arriving on their breeding grounds too late to take advantage of the peak in insects. Over time, this will likely lead to population declines for some boreal birds, insectivores and shorebirds; • The ability of wildlife to adapt to natural processes such as wildland fires will likely be compromised as these processes increase in intensity due to climate change; • The ability of caribou to forage for winter food sources has been and could continue to be affected by increased snowfall in regions of the NWT; and • Changes in permafrost and resulting altered habitat are impacting wildlife that prefers lichens, forested areas, bogs and wetlands. The scale of these changes is uncertain, but some evidence shows that it is significant in the Taiga Plains region of the NWT.

APPENDIX B

Climate Change Impacts, Knowledge Gaps, and Research and Monitoring Requirements

Natural Environment	
Changes to Wildlife continued	**Knowledge Gaps and Research and Monitoring Requirements:** • Undertaking climate change vulnerability assessments for all species-at-risk to inform better wildlife management decisions; • Tracking trends and changes in wildlife populations, health and distribution to determine impacts of climate change; • Continuing research and monitoring on changes to caribou food sources in the NWT and circumpolar countries based on a suite of climatic indicators; • Applying a suite of climatic indicators relevant to caribou to other species that are vulnerable to climate change to better predict population changes, inform management actions and alleviate other human-caused threats; • Conducting monitoring, particularly community-based monitoring, to track and manage non-indigenous and invasive species (e.g. mammals, birds, insects, amphibians and plants) that can pose a threat to wildlife and biodiversity as they extend their ranges and become established in the NWT; • Determining whether or not wildlife is adapting to changes, such as increases in parasites; • Completing NWT landscape monitoring at regular intervals (every 10 to 15 years) to assess changes to baseline conditions and help predict potential impacts to wildlife; • Continuing ongoing use of remote sensing techniques to assess wildlife habitat and impacts due to climate change (e.g. landscape change resulting from increased wildland fires); • Updating the 2006 NWT Biodiversity Action Plan with a new gap analysis to ensure actions for maintaining biodiversity in light of a changing climate are in place; and • Understanding cumulative impacts of climate change, industrial development and other stressors on wildlife species.

Natural Environment	
Changes to Freshwater Fish and Marine Mammals	**Impacts:** • Non-indigenous fish and marine mammal species are being observed more frequently by residents and researchers as their ranges expand. Colonization and invasion by non-indigenous species may threaten indigenous species due to increased competition for habitat and food; • Changes in ice cover duration may influence the growth, mortality, reproduction and seasonal migration of fish and marine mammals; • Variable lake and river levels influenced by climate change may threaten fish habitat and reproduction; • Declines in sea ice can lead to reduced birthing habitat and increase mortality for young seals, likely impacting their populations; • Ocean acidification is happening faster in the Beaufort Sea than predicted. Acidification (as a result of global increases in carbon dioxide in the atmosphere) will result in profound changes to marine ecosystem productivity, including fish and marine mammals; • Increases in water temperature impact the overwintering habitat and health of fish and marine mammals, including changes to spawning and rearing habitat, food availability and predators; • Increases in contaminant loads in fish and marine mammals from long-range and local contaminant sources could occur; • Impacts to contaminant loads in fish and marine mammals could occur due to the release of naturally occurring elements and contaminants from the frozen ground as permafrost thaws; • Lower levels of dissolved oxygen in lakes in winter due to climate change can negatively impact the survival of overwintering fish populations; and • Increases in predation risk, disease and parasitism, have the potential to affect the abundance and distribution of indigenous fishes.

APPENDIX B

Climate Change Impacts, Knowledge Gaps, and Research and Monitoring Requirements

Natural Environment	
Changes to Freshwater Fish and Marine Mammals continued	**Knowledge Gaps and Research and Monitoring Requirements:** • Improving baseline information to better understand the impacts of climate change on fish species, health and distribution in the North (as highlighted in Fisheries and Oceans Canada's Climate Change and Arctic Fisheries Research Program); • Ongoing monitoring of temperature-dependent contaminants (e.g. mercury) in ringed seal, beluga and subsistence fish species such as lake trout, burbot and lake whitefish; • Ongoing monitoring of non-indigenous fish and marine mammal species and associated diseases or parasites; • Monitoring vulnerable fish and marine mammal populations to develop conservation strategies; • Understanding the impacts of ocean acidification and oxygen depletion on fish and marine mammals; • Monitoring marine mammal population dynamics in the Beaufort Sea, as sea ice declines in extent, duration and thickness, negatively affecting habitat for some species and potentially expanding ranges for others; • Understanding climate change impacts on aquatic ecosystems and fisheries for Great Slave and Great Bear Lakes (e.g. temperature profile changes being observed in Great Bear Lake); • Addressing knowledge gaps on the cumulative impacts of multiple stressors, including climate change, on fish and marine mammals; • Determining appropriate biological indicators to assess vulnerability, resilience and adaptation of fish and marine mammal populations and providing early warnings of climate-induced changes; and • Determining changes in contaminants in fish and marine mammals over time and the implications as food sources for wildlife and humans.

Human Health, Public Safety, and Culture and Heritage	
Human Health	**Impacts:** ***1. Potential Negative Impacts on Physical Human Health:*** • Zoonotic infectious diseases (transmitted from wildlife to humans) or outbreaks may spread northward. These could include Lyme disease, West Nile virus, Hantavirus and Rocky Mountain spotted fever, among others. In the past, human diseases or reservoir species might not have survived in the cold temperatures, but as the region warms, new diseases could emerge. These may be food or waterborne, transmitted by insects, ticks and rodents, or the result of exposure to wildlife through hunting. Re-emergence of other diseases no longer common in the NWT is also likely (e.g. brucellosis and anthrax); • Risk of illness or death in people with heart and respiratory problems due to higher temperatures, extreme weather, wildland fires and smoke may increase; • Increased human exposure and associated health risks (e.g. sunburns, skin cancers, cataracts and eye damage) due to elevated ultraviolet radiation levels from stratospheric ozone depletion may occur; • Increases in eye, nose and throat irritation, shortness of breath, exacerbation of respiratory conditions and allergies, chronic obstructive pulmonary disease and asthma, due to negative impacts of wildland fires on air quality could occur; • The increased production of pollens and spores by plants may lead to more frequent and heightened allergic reactions due to longer growing seasons; • Increased health impacts resulting from source drinking water contamination could increase due to extreme weather events, floods or wildland fires leading to source water contamination; • Concerns with food safety and potential health impacts resulting from increases in contaminant loads (e.g. from long-range and from local climate-related sources) in country foods due to climate change. Contaminants such as mercury and persistent organic pollutants pose risks to human health; and • Concerns with country food safety resulting from increases in wildlife diseases or parasites which, in turn, impact human health.

APPENDIX B

Climate Change Impacts, Knowledge Gaps, and Research and Monitoring Requirements

Human Health, Public Safety, and Culture and Heritage	
Human Health continued	**Impacts** (continued)**:** ***2. Negative Impacts on Food Security and Mental, Social and Cultural Well-being:*** • Limitations to traditional harvesting and cultural/land-based activities, leading to altered lifestyles, which have negative impacts on mental health (e.g. lack of social and cultural activities) and well-being (e.g. decreased physical activity and greater reliance on store bought food); • Decreased food security due to changes in wildlife, fish and plant habitat and health affecting the availability of country foods, which is of utmost importance to Indigenous peoples who have depended on these food sources for generations; and • Psychological health effects including mental health problems and stress-related illnesses. ***3. Potentially New Opportunities for Growing Local Food:*** • A positive impact could be an increase in some food sources, such as cultivated crops in community gardens as a result of longer growing seasons, and opportunities for new agriculture sectors in the NWT. **Knowledge Gaps and Research and Monitoring Requirements:** • Further research and monitoring of country food sources, including their health, abundance and distribution, to determine availability and quality of food sources for generations to come; • Surveillance systems that enhance the ability to support predictions of species distribution changes and associated public health impacts (e.g. appearance of species carrying diseases that can be transmitted to humans, and new and re-emerging infectious diseases) associated with climate change are needed; • An improved understanding of environmental toxicology and greater risk communications capacity to address human health implications associated with long-range and local environmental contaminants, particularly as it relates to changing climate; • Continued source water protection planning for NWT communities, including linkages with the monitoring of drinking water quality and safety of water supplies in reservoirs; and

Human Health, Public Safety, and Culture and Heritage	
Human Health continued	**Knowledge Gaps and Research and Monitoring Requirements** (continued)**:** • Assessments of risks to human health arising from air quality issues related to wildland fires, as well as flood and heat event prediction, assessment of land cover changes, and associated implications for the safety and security of local food and water resources for communities.
Public Safety	**Impacts:** • Physical injuries, illnesses and deaths from extreme weather events, floods, wildland fires, erosion, permafrost thaw slumps, critical infrastructure failure and transportation accidents; • New risks to the people, property, environment and economy of the NWT could arise as new opportunities and commercial activity potentially increase; • Increased erosion has led to the removal and closure of buildings close to shorelines (ocean and river) and greater risk to infrastructure; • Adverse impacts to transportation infrastructure, such as roads, bridges and airstrips, as well as changes to navigable waters and air space; • Evacuation of communities, damage to property and infrastructure, contamination of surrounding water and disruption of essential services can all result from significant hazards such as wildland fires and floods; • Food insecurity is a cross-cutting concern that impacts the safety of residents and wildlife; and • Drought can impact the production of hydroelectricity, water navigation, food availability and wildlife distribution patterns.

1523

APPENDIX B

Climate Change Impacts, Knowledge Gaps, and Research and Monitoring Requirements

Human Health, Public Safety, and Culture and Heritage	
Public Safety continued	**Knowledge Gaps and Research and Monitoring Requirements:** • The NWT Hazard Identification Risk Assessment Report (2014) considered climate change in its assessment of current hazards, projecting which hazards could occur more frequently or become more extreme in the future. Two hazards – floods and wildland fires – were deemed top hazards in the NWT, and are a priority for research and monitoring to ensure public safety; • Expanding the ability to predict and monitor flood activity; and • Ongoing research and monitoring of other hazards identified in the NWT Hazard Identification Risk Assessment Report, such as extreme weather, coastal erosion, thawing permafrost, invasive species, etc., to support planning for public safety.
Culture and Heritage	**Impacts:** • Challenges related to unpredictable weather and ice conditions when traveling on the land for hunting, fishing, trapping and camp access may impact the traditional and cultural activities and economies (e.g. sale of wild furs) of Indigenous people; • Less predictable weather and ice conditions may impact the wide variety of on-the-land cultural, recreational and spiritual activities of NWT residents; • Stresses to country food sources due to climate change and related impacts on cultural activities (e.g. harvesting activities may be affected by decreased wildlife or fish populations); • Heritage resources (e.g. archaeological sites) are at risk from processes such as coastal erosion, landscape disturbances caused by thawing permafrost, melting alpine ice and wildland fires; and • As local climates change, the ability of traditional and local knowledge holders to utilize their knowledge on the land may be affected.

Human Health, Public Safety, and Culture and Heritage	
Culture and Heritage continued	**Knowledge Gaps and Research and Monitoring Requirements:** • Understanding the impacts of climate change on the traditional lifestyles and practices of Indigenous and local people; and • Understanding where heritage resources are at greatest risk from climate change-related disturbances.

Infrastructure	
	Impacts: • Several NWT communities have infrastructure subject to potential structural failure due to degrading permafrost and additional snow load effects; • Certain communities may be subject to extended loss of power due to transmission line failures caused by extreme weather events arising from climate change; • Potential loss of infrastructure and buildings in the four NWT coastal communities along the Beaufort Sea could occur due to coastal erosion; • Several NWT communities are subject to flood risk from river flooding due to ice jams or sea level rise, both of which may increase as a result of climate change; • Compromised ability to generate hydroelectricity due to droughts; • Lack of sufficient water flow for the passage of river barges and ferries; • Warmer winters resulting in shorter winter road seasons, compromising the long-term viability of winter roads and increasing risks; and

1525

APPENDIX B

Climate Change Impacts, Knowledge Gaps, and Research and Monitoring Requirements

Infrastructure	
	Impacts (continued)**:** • Linear infrastructure such as highways, airports and transmission lines, and isolated infrastructure such as mines, hydroelectric facilities and radio/microwave transmission towers, are potentially at risk from climate change impacts such as extreme weather events, thawing permafrost and increased frequency and severity of wildland fires.
	Knowledge Gaps and Research and Monitoring Requirements: • Increased monitoring of key environmental components, including microclimate effects like precipitation, air temperature, permafrost, forest composition and water levels, to better understand potential impacts on infrastructure and buildings; • Long-term monitoring and forecasting of infrastructure stability in NWT communities; • Long-term monitoring, analysis and forecasting of impacts of climate change on linear infrastructure (e.g. the new all-season Highway 10 from Inuvik to Tuktoyaktuk); • Long-term monitoring and forecasting of impacts of climate change on infrastructure that support essential services; • Undertaking research and development and test projects with various experts to improve knowledge and allow for the development of new designs and measures to mitigate or adapt to climate change impacts for a wide range of northern infrastructure; • Continuing to work with other jurisdictions on research, development and best practices; • Updating climate change risk assessments for major infrastructure; • Continuing to explore the potential for remote sensing and other technology to acquire settlement and movement data as part of a monitoring program for buildings and other critical infrastructure; and • Continuing to work with other jurisdictions to lead and reinforce research and development, including the current research and development sites on Highway 3 and Highway 10.

APPENDIX C

Sustainability of Ecosystems as a Response to Climate Change

Numerous planning processes govern and support the management of NWT ecosystems and natural resources. These can contribute to improving ecological, social and economic resilience and adaptation to climate change and will likely need to be updated in the future to better account for ongoing climate change-related impacts and opportunities.

Three examples are provided below.

CONSERVATION NETWORK PLANNING

Northern ecosystems are diverse and particularly sensitive to climate change. Conservation network planning involves the protection of biodiversity through the establishment and management of protected and conservation areas, while recognizing the relationship between social well-being, ecological health, sustainable livelihoods and economic prosperity. A conservation network ensures that protected areas fall within a broader land management framework that includes land use planning, regulatory requirements, monitoring activities and best practices, to ensure they do not become isolated and less resilient to change.

The inclusion of healthy populations and ecosystems, ecological representation, enduring landscape features and traditional knowledge in protected areas is important to conservation network planning. These aspects can help maintain and build both ecological and social resilience to a changing climate. Connectivity of certain protected and conservation areas can support the adaptation and survival of species in the face of climate change by facilitating their movement to more suitable environments.

The protection of biodiversity ensures the continuation of vital ecosystem services, such as clean water and climate stabilization. It also protects cultural and spiritual pursuits, increases social well-being, provides food provisioning services, cultural and eco-tourism business opportunities and commercial renewable resource harvesting opportunities, and contributes to the arts and crafts industry and the traditional economy.

Healthy Land, Healthy People outlines the GNWT's priorities for the advancement of conservation network planning from 2016 to 2021, based on the principles and objectives of the GNWT Land Use and Sustainability Framework. Continuing to incorporate climate change considerations based on the best traditional, local and scientific knowledge into conservation network planning is imperative, and will support the establishment of existing candidate areas and the identification of new potential protected and conservation areas.

Integrating climate change considerations will be undertaken through careful adaptive management and the monitoring of protected and conservation areas to detect impending changes in ecosystems, in order to adjust flexibly as new knowledge becomes available.

1527

APPENDIX C

Sustainability of Ecosystems as a Response to Climate Change

GNWT LAND USE AND SUSTAINABILITY FRAMEWORK

Northern Lands, Northern Leadership: The GNWT Land Use and Sustainability Framework sets out a vision, guiding principles and land interests to guide how the GNWT manages land and resources. It seeks to balance economic, environmental and cultural interests in land and resource management decisions.

In support of the vision set out in the Land Use and Sustainability Framework, the GNWT is developing a suite of government-wide land use and sustainability objectives to be incorporated into government decision processes that will ensure a consistent GNWT-wide approach to implementing the Land Use and Sustainability Framework. Including climate change considerations in all land and resource decision-making will be central to adapting to the changing climate.

REGIONAL LAND USE PLANNING

Regional land use planning is an ongoing process in the NWT. Regional land use plans define where and how certain land use activities can take place. Land use plans are statutory requirements in the Gwich'in and Sahtu Settlement Areas, flowing from comprehensive land and resources agreements. Pursuant to these agreements and as set out in the Mackenzie Valley Resource Management Act, land use planning is a shared responsibility in the NWT. The GNWT, along with Indigenous and federal governments, have authorities respecting the approval of regional land use plans. For example, the Tłı̨chǫ Wenek'e - Tłı̨chǫ Land Use Plan (2012) states that when new information related to climate change is found, an amendment to the land use plan may be considered, including strategies relating to adaptation and mitigation. Other settled and unsettled land claim regions have or are pursing land use planning initiatives.

Climate change is changing the way land is used. Conversely, the way land is used has an impact on GHG emissions and climate change. Land use plans are an important policy tool to respond to climate change. Climate change considerations can be incorporated into the vision and objectives of a plan and built into legally binding conformity requirements, which can assist with climate change adaptation on a regional level.

APPENDIX D

Current and Potential Adaptation Efforts to Address Climate Change Impacts

Resilience and adaptation measures will be required for many of the impacts to the natural environment, human health, public safety, culture and heritage, and infrastructure identified in Appendix B.

The numerous current and potential adaptation efforts listed below will serve as a starting point to inform the development of the 2019-2023 Action Plan to implement the 2030 NWT Climate Change Strategic Framework.

Further engagement with community, Indigenous, territorial and federal governments, industry, non-government organizations, academic institutions, regulatory and resource management boards, stakeholders and the public will take place in 2018 to seek input on the implementation of these and other identified actions.

CLIMATE CHANGE IMPACTS, KNOWLEDGE GAPS, AND RESEARCH AND MONITORING REQUIREMENTS

Natural Environment	
Climate and Weather	• Enhancing community-based monitoring and management to better inform communities and gain an understanding of potential adaptations required due to climate change; • Enhancing land-based climate monitoring to better inform climate change adaptation decision-making; • Completing vulnerability assessments to identify NWT locations susceptible to extreme weather or other natural hazards; • Enhancing marine climate monitoring in the Beaufort Sea, Great Bear Lake and Great Slave Lake using weather buoys; • Projecting sea level rise for the NWT due to climate change; • Enhancing weather warnings for extreme conditions, including air quality; • Undertaking predictive climate modeling to allow planning for extreme weather events, such as drought; • Enhancing climate data and predictive information for the current and future climate to inform decision-making for adaptation;

APPENDIX D

Current and Potential Adaptation Efforts to Address Climate Change Impacts

Natural Environment	
Climate and Weather continued	• Developing projections of future climate for the NWT that can be expected with increased levels of GHGs; and • Adjusting community services as a result of increasing extreme or variable weather events (e.g. ensuring equipment and staff are in place to deal with greater snowfalls).
Permafrost	• Enhancing community-based monitoring and management to better inform communities and gain an understanding of potential adaptations required due to climate change; • Increasing the NWT's capacity with respect to permafrost research, science, engineering and infrastructure to adapt to quickly changing conditions resulting from permafrost thaw; • Developing a permafrost data management system to inform planning, adaptation and mitigation related to permafrost thaw; • Fostering science-based decision-making tools to assist with project planning and development in permafrost regions; • Improving and implementing building standards so that thawing permafrost conditions are adequately taken into consideration for all infrastructure design and construction; • Considering the effects of climate change in planning for industrial development (both infrastructure and closure and reclamation) by fully integrating impacts of permafrost thaw and climate change into project planning and environmental assessment, water licensing and land use permitting processes; • Considering impacts to traditional harvesting and cultural and heritage resources and determining adaptations accordingly; and • Developing methodologies and technologies to maintain and enhance permafrost on the landscape as long as climatically possible.

Natural Environment	
Water Quality and Quantity	• Enhancing community-based monitoring and management to better inform communities and gain an understanding of potential adaptation required due to climate change; • Potential adjustments to harvesting practices due to changes in water level and ice quality (e.g. fishing or trapping in safer areas or for different periods of time throughout the year); • Infrastructure planning to ensure local water treatment plants can provide safe and adequate supplies of drinking water where changes to water quality and quantity have a negative impact on source water; • Continued source water protection planning for NWT communities, including linkages with the monitoring of drinking water quality and safety of water supplies in reservoirs, in light of climate change; • Flood forecasting in communities at risk, due to potential impacts of flooding to infrastructure, public safety, human and wildlife health, and drinking water quality; • Using available satellite imagery and technology to monitor ice cover to support flood forecasting, spring breakup predictions and sediment loads in rivers, providing valuable information for traditional and recreational land-users; • Modifying transportation methods and infrastructure due to shorter or non-existent winter transportation seasons and changes to freeze-up/breakup patterns; • Monitoring groundwater flow changes due to thawing permafrost to determine required adaptations; • Infrastructure and emergency planning to address potential flooding; • Increasing water flow and level monitoring to inform future hydroelectric development planning and flood forecasting; • Water conservation and drought management planning; • Ensuring wetlands are maintained, as they help buffer against the effects of climate change by storing carbon; and • Considering predicted changes due to climate change when setting terms and conditions in water licences.

1531

APPENDIX D

Current and Potential Adaptation Efforts to Address Climate Change Impacts

Natural Environment	
Forests and Tundra Vegetation	• Enhancing community-based monitoring and management to better inform communities and gain an understanding of potential adaptations required due to climate change; • Undertaking forest health monitoring across the NWT to serve as an early detection system for rapid changes occurring on the forested landscape, in order to facilitate adaptive management; • Utilizing remote sensing techniques to track changes in vegetation, hydrology, land cover and other factors over large areas to identify landscape-level changes and inform decisions related to adaptation; and • Collaborating with community, Indigenous and federal governments, academic institutions and others to conduct research into fire regimes, forest recovery patterns and the effects of permafrost and hydrology changes to inform decisions related to adaptation.

Natural Environment	
Wildlife	• Enhancing community-based monitoring and management, particularly through wildlife co-management boards and systems in place in unsettled land claim areas, to better inform communities and gain an understanding of potential adaptations required due to climate change; • Supporting wildlife through the establishment and management of strategic plans (e.g. a NWT barren-ground caribou management strategy is being updated with monitoring and managing activities for cumulative effects, including climate change effects); • Sustainable management of wildlife species by the GNWT, Indigenous governments and wildlife co-management boards; • Undertaking a new gap analysis for the NWT Biodiversity Action Plan with a focus on climate change impacts, and potential adaptations; • Ongoing dissemination of current and new information on the health and distribution of wildlife, including diseases and parasites, so that harvesters and residents can adapt to possible changes in wildlife due to warming temperatures; • Developing strategies to assess and potentially adapt to invasive species that could negatively affect wildlife; • Facilitating the adaptation of residents and non-residents to climate-related changes in wildlife (e.g. restrictions in hunting certain species may be needed, while species that are expanding their ranges could be harvested instead, providing a new food source to residents); • Planning for the enhanced resilience of wildlife populations by better understanding impacts and stressors and the effects of climate change on mitigation measures; and • Assessing the impacts on wildlife of all new projects related to climate change adaptation (e.g. all-weather roads, assisted species migration and agriculture).

APPENDIX D

Current and Potential Adaptation Efforts to Address Climate Change Impacts

Natural Environment	
Freshwater Fish and Marine Mammals	• Enhancing community-based capacity for monitoring and assessment of climate change impacts to inform necessary adaptation; • Developing consumption advisories as needed, due to potential increases in contaminants in fish and marine mammals. Advisories could require residents to adapt by making changes to their diets, carefully considering consumption of alternative fish species and other food sources, or fishing from water bodies with lower contaminant concentrations in fish; • Considering harvesting non-indigenous species to sustain commercial and subsistence harvest, should the abundance of indigenous fish species decrease in some areas; • Developing strategies to assess and potentially adapt to invasive species in freshwater and marine environments; • Developing research programs to better understand the impacts of climate change, and including adaptation tools and strategies into fisheries management plan considerations (e.g. through Fisheries and Oceans Canada's Aquatic Climate Change Adaptation Services Program); and • Developing research programs on the evaluation of ecosystem-based adaptive management strategies for some northern aquatic ecosystems. This work will allow researchers to integrate traditional, local and scientific knowledge and international practices into modeling frameworks to better understand the effects of climate change on NWT fish and marine mammal population production, leading to the development of adaptation tools for sustainable management of fisheries.

Human Health, Public Safety, and Culture and Heritage	
Human Health	• Developing the capacity of the health and social services workforce to address climate risks by supporting capacity building through setting of norms and standards, technical guidance and training courses, and integrating climate change and health topics into clinical, public health and social services training; • Enhancing health information systems, analytics tools and capacity to support timely analysis and surveillance of emerging infectious diseases; • Supporting research that examines improved risk assessment and response to protect human health from the effects of climate change; • Assessing the impacts of climate change on health and social services to ensure the capacity needed to withstand climate risks and provide essential services, particularly during extreme weather events or situations arising from climate change-related events, is developed; • Strengthening the management of environmental determinants of health, climate-informed health programming and emergency preparedness; • Planning for wildland fire suppression and adopting FireSmart principles (strategies and planning measures to help reduce the risk and minimize the unwanted effects of wildland fires) in communities to help adapt to negative impacts of wildland fires, such as air quality; • Developing a reliable system for determining and releasing health alerts and advisories to minimize impacts on human health; • Improving geo-mapping to identify and communicate trends in potential contaminants to better support the dissemination of public health advisories on the consumption of traditional foods with elevated contaminants; • Developing and delivering educational and public outreach materials to support communities in building resilience and adapting to human health concerns; • Supporting access to country foods where access has become limited due to climate change impacts; and • Addressing food insecurity by increasing local food production (e.g. community gardens and raising animals such as chickens and goats) to take advantage of a lengthier growing season and develop new agricultural sectors in the NWT.

1535

APPENDIX D

Current and Potential Adaptation Efforts to Address Climate Change Impacts

Human Health, Public Safety, and Culture and Heritage	
Public Safety	• Ensuring community emergency plans include approaches for assessing climate change-related hazards and adapting to the increase in frequency and severity of such hazards. The GNWT supports communities with this planning by providing guidance and a template for community emergency plans. When a need is identified, the GNWT provides community emergency planning workshops that include assessment of risks; • For the very high hazard of wildland fire, implementing strategies such as adopting FireSmart principles and considering the use of FireSmart programs for all communities. Creating wildland fires education training and awareness sessions for first responders and the public and implementing fire prevention practices are also possible adaptations; • For the very high hazard of flooding, developing flood plain hazard maps to support land use and building bylaws to minimize flooding and subsequent erosion on infrastructure. The establishment of flood watch committees to monitor changing ice breakup or flooding conditions is a specific adaptation to be better prepared for floods; and • Ensuring residents, first responders, communities and the GNWT are better prepared to deal with the impacts of all hazards, ranging from low through to very high risks. Examples of adaptation approaches include the development of educational resources, training, capacity building and preparedness programs and plans.
Culture and Heritage	• Conducting research to understand where heritage resources are at greatest risk of impact from processes, such as coastal erosion, landscape disturbances caused by thawing permafrost, melting alpine ice and wildland fires, will assist in prioritizing resources to mitigate impacts on heritage resources; • Prioritizing the collection of information from heritage resources at greatest risk of impact from climate change; • Supporting traditional economies, such as trapping for the harvest of wild furs; and • Strengthening communities socially and culturally to help build resiliency through the documentation and use of traditional knowledge. Involving youth and elders in on-the-land programming to ensure local and traditional knowledge and Indigenous languages are passed on to future generations.

Infrastructure	
Transportation System	• Continuing to pursue opportunities for installation of permanent bridges to replace ferry crossings (where vulnerable to fluctuating water levels); • Continuing to pursue opportunities for installation of permanent bridges to extend winter road seasons; • Construction of all-season roads to replace winter roads; • Implementing measures to address permafrost instability under highways and airport runways; and • Ongoing research and development on NWT transportation networks to develop better engineering and construction processes, as well as mitigation measures to address the real and potential effects of climate change.

APPENDIX D

Current and Potential Adaptation Efforts to Address Climate Change Impacts

Infrastructure	
Community and Public Infrastructure	• Enhancing building codes and standards, including energy (existing and new); • Enhancing bridge codes and standards (existing and new); • Enhancing geometric design guidelines (existing and new); • Enhancing requirements of the GNWTs technical reference handbook, Good Building Practice for Northern Facilities; • Mandating that all designs incorporate the applicable requirements of the *Northern Infrastructure Standardization Initiative*; • Implementing measures to mitigate permafrost instability affecting community and public infrastructure by improving surface water management; • Enhancing water intake, water treatment, sewage systems and lagoons and waste management systems to be resilient to emerging climatic conditions; • Ensuring that private sector investments (businesses and housing) are resilient to emerging climatic conditions; • Supporting emergency preparedness and developing enhanced community emergency response plans; and • Enhancing infrastructure capacity and readiness (e.g. adequate community emergency shelters for climate change-related events and facilities with the capability to offer indoor clean air shelters for sustained wildland fire smoke events).
Utilities and Other Infrastructure	• Enhancing codes and standards for infrastructure, such as hydroelectric, mining, and oil and gas facilities; • Enhancing codes and standards for linear infrastructure, such as transmission lines; and • Long-term planning for the management of climate change impacts on the remediation of legacy contaminated sites.

Government of Northwest Territories
Gouvernement des Territoires du Nord-Ouest

If you would like this information in another official language, call us.
English

Si vous voulez ces informations dans une autre langue officielle, contactez-nous.
French

Kīspin ki nitawihtīn ē nīhīyawihk ōma ācimōwin, tipwāsinān.
Cree

Tłı̨chǫ yatı k’ę̀ę̀. Dı wegodı newǫ dè, gots’o gonede.
Tłı̨chǫ

ʔerıhtł’ís Dëne Sųłıné yatı t’a huts’elkër xa beyáyatı theʔą ʔat’e, nuwe ts’ën yółtı.
Chipewyan

Edı gondı dehgáh got’ı̨e zhatıé k’ę̀ę̀ edatł’éh enahddhę nıde naxets’ę́ edahłí.
South Slavey

K’áhshó got’ı̨ne xədə k’e hederı ʔedı̨htl’é yerınıwę nídé dúle.
North Slavey

Jii gwandak izhii ginjìk vat’atr’ijąhch’uu zhit yinohthan jì’, diits’àt ginohkhìi.
Gwich’in

Uvanittuaq ilitchurisukupku Inuvialuktun, ququaqluta.
Inuvialuktun

Ċᵇᑯᐊ ᑎᑎᖅᑲᐃᑦ ᐱᔪᒪᒍᕕᒋᑦ ᐃᓄᒃᑎᑐᓕᖅᓯᒪᓗᑎᒃ, ᐅᕙᑦᑎᓐᓄᑦ ᐅᕐᑳᓚᔪᓐᓇᖅᑐᑎᑦ.
Inuktitut

Hapkua titiqqat pijumagupkit Inuinnaqtun, uvaptinnut hivajarlutit.
Inuinnaqtun

Aboriginal Languages Secretariat: 867-767-9346 ext. 71037
Francophone Affairs Secretariat: 867-767-9343

ATULIQTUQ: ACTION AND ADAPTATION IN NUNAVUT

CLIMATE CHANGE ADAPTATION PLANNING: A NUNAVUT TOOLKIT

CANADIAN INSTITUTE OF PLANNERS | INSTITUT CANADIEN DES URBANISTES
Shaping our Communities Sustaining Canada's Future | Bâtir nos communautés Pour un Canada viable

Canada

Nunavut

Acknowledgements

The Nunavut Toolkit was prepared for the Canadian Institute of Planners by Beate Bowron, President, Beate Bowron Etcetera, and Gary Davidson, President, The Davidson Group. The authors are also responsible for the photographs. Members of the Nunavut Climate Change Partnership provided input to the document and commented on a draft version. We would like to thank everyone for their insights and suggestions.

The authors also want to recognize Shane Azam of Shane Azam Enterprises for the document design.

This document or parts thereof may be reproduced for non-commercial purposes, as long as it is referenced appropriately.

March 2011

INTRODUCTION

What Is Climate Change

Climate change, sometimes referred to as global warming, is the long-term increase in average global temperatures. Climate change is causing changes to normal weather conditions such as higher local temperatures and more frequent and erratic extreme weather events. In the Arctic regions temperature increases are expected to be double the rate as in the rest of the world accompanied by a reduction in snowfall and an increase in rain.

In Nunavut climate change impacts are all too evident. The multi-year sea ice is diminishing and much later freeze-up is affecting wildlife and hunting practices. Thawing permafrost is destabilizing buildings and other infrastructure, and storms and rising sea levels are causing coastal erosion.

Nunavummiut can do little to mitigate climate change, that is reduce the local emissions of greenhouse gases, because of Nunavut's remoteness, its arctic landscape and dependence on supplies from "the south". Instead it must focus on adaptation measures to deal with negative climate change impacts and seize opportunities that may materialize.

The Nunavut Climate Change Partnership

The Nunavut Climate Change Partnership (NCCP) was formed in 2008. Entitled "Atuliqtuq: Action and Adaptation in Nunavut" the Partnership's three main themes are:

- To build capacity for climate change adaptation planning within the Government of Nunavut and communities
- To develop tools to collect, publish, share and communicate climate change adaptation knowledge across the communities of Nunavut and beyond
- To create scientific information that is regionally and locally targeted to help communities adapt to climate change and transfer this capability into Nunavut

The Partnership consists of four organizations: the Government of Nunavut (GN) (Departments of Environment and Community & Government Services); Canadian Institute of Planners (CIP); Natural Resources Canada (NRCan); and Indian and Northern Affairs Canada (INAC). INAC has provided the funding for the Partnership projects. One of the results of the Partnership is this Toolkit.

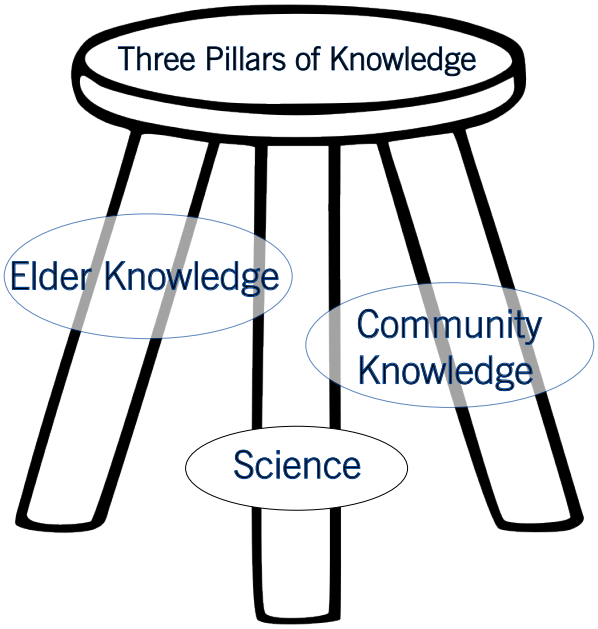
Purpose and Basis of the Toolkit

The purpose of the Toolkit is to help Nunavut communities to plan for climate change adaptation. The Toolkit will expedite adaptation planning efforts and will ensure that the approaches used to develop climate change adaptation plans are similar. The Toolkit is a cost-effective way for smaller communities to prepare a Climate Change Adaptation Plan (CCAP) under the guidance of a planner.

The Toolkit is based on lessons learned from completing community climate change adaptation plans in seven Nunavut communities: Clyde River and Hall Beach (2008); and Arviat; Cambridge Bay; Iqaluit; Kugluktuk; and Whale Cove (2010). These lessons and considerable input from the Nunavut Climate Change Partnership were instrumental in developing this Toolkit.

What Is a Community Climate Change Adaptation Plan

A Climate Change Adaptation Plan (CCAP) assists Nunavut communities to adapt to climate change. The plan describes climate change impacts affecting a community, assesses their relative risks and outlines possible opportunities climate change may create. It ranks these risks and opportunities in order of priority and makes recommendations for actions to be taken. A CCAP is a separate plan and can inform and feed into other types of plans such as community plans, emergency management plans, infrastructure budgets, etc.



Climate Change Adaptation Planning in Nunavut

Adaptation planning in Nunavut is based on three pillars of knowledge: Elder knowledge (Inuit Qaujimajatuqangit), science, and community knowledge.

These three types of knowledge are different from each other and must be integrated to achieve a balanced climate change adaptation plan.

Working in Nunavut means working in small and isolated communities and working with a translator during all community activities. Translation and cultural traditions establish the pace of the planning process. The seasons impose constraints on public involvement, since community members are out on the land and sea at different times of the year.

How Will the Toolkit Be Used

It is important that communities understand and endorse the adaptation planning process. However, the plan-making must be led by a planner. The Toolkit helps the planner develop a CCAP with the community. The planner may work in a consulting firm or for the Government of Nunavut's Department of Community & Government Services (CGS) or the Department of Environment (DoE). This Toolkit has been developed specifically for Nunavut, but it will also be useful for other northern Canadian communities.

Steps to Climate Change Adaptation in Nunavut

This Toolkit outlines a straighforward, easily understandable, 5-step process as show below in Diagram 1.

Diagram 1

How the Toolkit Is Organized

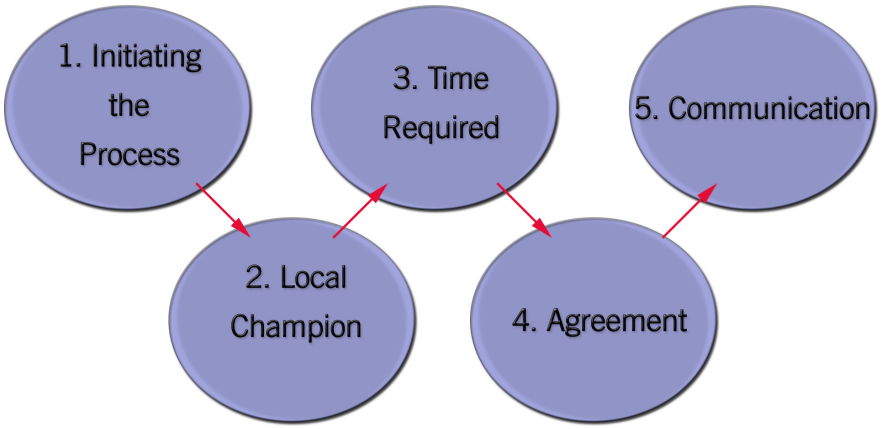
The Toolkit is organized around the five Steps to Climate Change Adaptation in Nunavut. Each step has a number of components, which outline the tasks to be completed in detail. Each component includes Sources where applicable, Techniques to be used for completing various tasks, a Checklist and Helpful Hints. In addition, the responsibility for each of the steps is assigned.

A section at the end of the Toolkit brings together summaries of the five Steps to Climate Change Adaptation in Nunavut, assigned responsibilities and an overview of the functions, events and estimated duration of each of the five community visits. A model hamlet council resolution agreeing to the CCAP process, a glossary of certain techniques and a glossary of acronyms are also included.

STEP ONE – GETTING STARTED

The five components of Step One are shown below in Diagram 2.

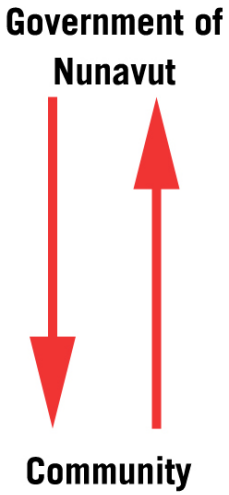
Diagram 2



If you don't start right, you won't finish!

Initiating the Process

The climate change adaptation planning process can be initiated either by a community or by the Government of Nunavut (GN). Either may initiate the process because of severe climate change impacts in a community that have to be dealt with or to determine which infrastructure improvements are most important. A CCAP may also be needed to feed into another type of planning process such as revisions to the existing community plan or to the community's emergency measures plan.



Local Champion

If the community initiates the climate change adaptation planning process, a local champion exists already. The local champion promotes the process to the GN and among community members. The local champion can be anyone who is well connected in the community, is concerned about climate change and has the time to be involved.

Examples include: an Elder; a councillor; the Senior Administrative Officer (SAO); the Planning and Lands Administrator (PLA); a member of the Hunters and Trappers Organization (HTO); or any community member.

Time Required

It is expected that a CCAP will be completed within 18 months. Five visits to the community are sufficient to accomplish the tasks outlined for each of the adaptation planning steps. The visits are multi-purpose and of different lengths. Some steps stretch over more than one visit. A summary of the functions and events during each of the five visits, as well as the estimated time of each, can be found at the end of the Toolkit.

Agreement

Both the hamlet council and the GN must formally commit to the CCAP process. Hamlet council will pass a resolution to develop a CCAP in their community and the GN will forward a Letter of Understanding confirming the timelines for the project and verifying that resources are available to complete the CCAP. A model resolution is included at the end of the Toolkit.

Once agreement has been reached to proceed with the CCAP, the planner who will develop the plan is confirmed. At this stage a local resource person is identified as well, who may or may not be the local champion and will most likely be the PLA. This resource person assists the planner with meeting logistics, notifications, finding an interpreter, etc.

Communication

Several Nunavut agencies and organizations need to be notified of the CCAP process to keep them informed and/or prepare them for possible cooperation. The existing Regional Community Planning Referral List can be used for this purpose. The Nunavut Planning Commission (NPC), other GN departments working in the community, Nunavut Tunngavik Incorporated (NTI), the regional Inuit associations, the Nunavut Impact Review Board (NIRB), other Institutes of Public Governance (IPGs) and the Nunavut General Monitoring Plan (NGMP) Secretariat in particular have to be notified.

After each community visit the planner will prepare a brief overview of activities completed. This report can be distributed to key community contacts as well as relevant GN departments and other agencies to keep everyone up-to-date.

Step One Checklist

- ✓ *Local champion*
- ✓ *Council resolution*
- ✓ *Planner*
- ✓ *Local resource person*
- ✓ *Notification (Agencies)*

Helpful Hints:

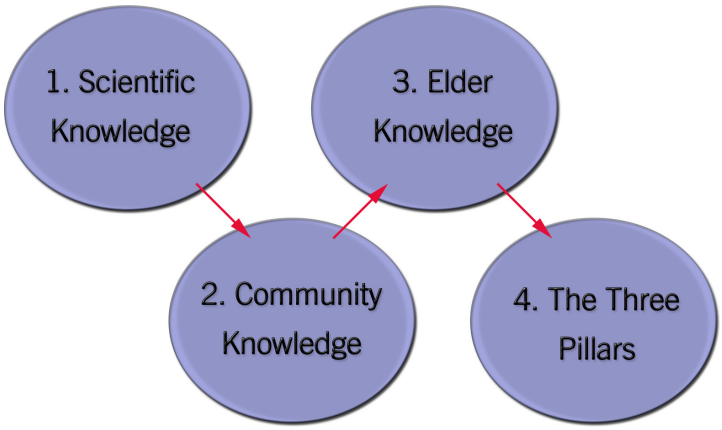
- The Regional Planner, the PLA and the Hamlet SAO are excellent sources of local information

STEP ONE RESPONSIBILITY: COMMUNITY AND GN

STEP TWO - BUILDING CLIMATE CHANGE KNOWLEDGE

The four components of Step Two are shown below in Diagram 3.

Diagram 3



All three types of knowledge depicted in Diagram 3 are required. Each type of knowledge is obtained through its own approach and must be available when the plan preparation commences. This ensures that each type of knowledge is balanced within the climate change adaptation plan.

Scientific Knowledge

Northern climate change planning often focuses on physical information such as; permafrost degradation, ice changes, sea level rise, etc. This type of knowledge is necessary but not sufficient. Also included in this knowledge category is a wide array of social science information. Together, both physical and social science compose this pillar of knowledge.

Developing the background knowledge input to the CCAP starts with looking at regional and local climate change scenarios. Scenarios provide high-level data on climate change elements such as temperature, precipitation, sea levels and wind patterns. From scenarios key local climate change impacts, both positive and negative, can be interpreted.

The information gathered from the scenarios can be supplemented and refined “on the ground”, if the planner and climate change scientists are in the community at the same time. Scientists will be able to point out physical impacts that may not be readily apparent.

General background information about the community completes this pillar. There are numerous reports on each community in Nunavut that provide background information, such as community plans and various GN wide strategies.

Sources:

Scenarios

- Environment Canada
- Canadian Climate Change Scenarios Network
- Ouranos

Impacts

- Centre for Indigenous Environmental Resources (CIER) Risk Assessment
- Natural Resources Canada
- CIP Climate Change Issues Report
- Department of Fisheries and Oceans (DFO)
- Arctic Climate Impact Assessment (ACIA)

Community

- Community & Government Services (CGS) for terrain analysis, community plans, constraint maps, etc.
- Department of Environment (DoE)
- Energy profiles
- Master drainage plans, if available
- Government of Nunavut (GN) sector plans such as economic development, airports, transportation, housing, emergency management, wellness and capital plans
- Nunavut Research Institute (NRI) reports
- ArcticNet reports

Techniques:

- Scenario building
- Impact interpretation
- Community profile
- Background research
- Report review
- "Walk-about" with scientists

Community Knowledge

Developing a community knowledge base is a major component of the adaptation planning process. This Toolkit stresses community knowledge and not just community input into the planning process. In Nunavut this can only be done from within the community and takes time. While scientific knowledge has a regional flavour, community knowledge is very specific to the hamlet.

The first task is to identify key community members that have an interest in climate change and are willing to participate. The objective is to find individuals within the hamlet that the planner can get information from, bounce ideas off, help engage the community and participate in developing the adaptation plan. There are several areas to look:

- Planning and Lands Administrator (PLA)
- Hamlet councillors
- HTO
- School teachers/students
- SAO
- Nunavut departmental personnel
- Any agency active in the hamlet

Each community will have its own constellation of involved community members. To identify these individuals a simple technique called "Key Informants" is useful. It involves asking people who they think are knowledgeable and would be interested. Once you have found one, ask for other names. Soon you will have several key individuals to act as a community sounding board. They can provide information on climate change issues, impacts, risks, opportunities and suggest possible actions. Later, when married with information from community meetings, this knowledge pillar will be complete.

It takes two visits to construct the community knowledge pillar. The first is to identify and discuss community climate change issues and planning with key individuals and to bring the project to the community at large. The second involves the entire community. This approach to gaining community knowledge ensures that it becomes one of the foundations of the adaptation plan. This time is well spent and pays off with an adaptation plan that has a strong base in community knowledge.

Climate change language can be very technical and a local interpreter may be unsure how to translate specific terms. In 2005 the Nunavut Department of Culture, Language, Elders and Youth (CLEY) and Nunavut Tunngavik Incorporated (NTI) published a "Terminology on Climate Change" which explains climate change concepts in English, Inuktitut and Inuinnaqtun. This booklet should be given to the local interpreter(s) for their use.

Sources:

- Key community members interested in climate change
- Hamlet staff
- Councillors
- Local organizations
- Community at large

Techniques:

- Key Informant process
- Public meetings
- Community feast
- One-on-one interviews
- "Walk-about" with public works staff
- Radio call-in show
- Climate change art contest in school

Elder Knowledge

In Nunavut Elders bring a special type of knowledge to the planning process referred to as Inuit Qaujimajatuqangit or IQ for short. It is a wisdom that comes from a life time of experience on the land and sea. This wisdom is vital to any understanding of climate change impacts in Nunavut.

The SAO can provide the names of Elders. There may be an Elders' group in the community and there may be one for both women and men. Visits can be arranged to talk to the Elders and listen to their stories over tea and bannock. The objective is to learn about the Elders' perceptions of climate change issues, build rapport and involve them in the planning process. The approach is to hold a series of informal, social discussions to arrive at Elder knowledge that will assist in preparing the climate change adaptation plan.

It takes at least two visits to assemble the Elder knowledge pillar. Gaining this knowledge requires patience and attention. The Toolkit establishes Elder knowledge as a key pillar of the information that is needed to undertake climate change adaptation planning.

"[The] weather is changing, ice conditions are thinner, it's getting dangerous to take the same route during spring, they have to adapt to the new type of traveling." (Kugluktuk Elder)

Elder knowledge is woven into their stories, be patient and listen

Sources:

- All the Elders in the community

Techniques:

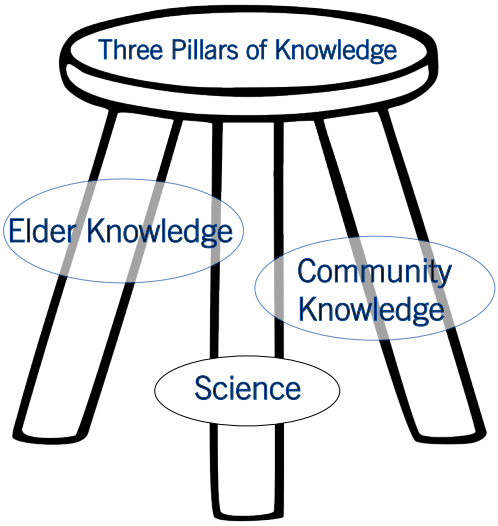
- Informal discussions over tea and bannock which is a traditional setting for discussion
- Brainstorming
- Story telling

The Three Pillars

Step Two in the Toolkit is building the three knowledge pillars that are required to undertake a climate change adaptation plan in Nunavut. Each pillar is constructed separately and there is a different approach for each. This enables the knowledge from each pillar to be given equal weight. The various insights from each of the pillars form the collective knowledge for developing the adaptation plan for a community.

Each pillar, though different, is not at odds with the others. The planner needs to assemble knowledge from each pillar and construct an integrated whole to report to the community.

During the development of the three knowledge pillars gaps will become apparent. Plans are never prepared with complete information. The community needs to press on with the knowledge it has at the time. A CCAP is a living document. New information can be added through amendments and the Plan will be reviewed every five years so that new information can be incorporated.



Step Two Checklist

- ✓ *Community background information*
- ✓ *Climate change science*
- ✓ *Community scenarios and impacts*
- ✓ *List of key informants*
- ✓ *Summary of community knowledge*
- ✓ *List of Elders*
- ✓ *Summary of Elder knowledge*
- ✓ *Integration of the three pillars*

Helpful Hints:

- Elder knowledge is precious to the Elder and must be compensated

- Have background information in place before community visits begin

- Scientists, the planner and community representatives should organize community "walk-about" at the first visit

- Door prizes bring people out to meetings

- Advertise meetings by poster and in the newspaper well in advance and by radio and Facebook the day before and the day of the meeting

- Give CLEY/NTI booklet on Climate Change Terminology to local interpreter(s)

STEP TWO RESPONSIBILITY: THE PLANNER

STEP THREE – PREPARING THE PLAN

The six components of Step Three are shown below in Diagram 4.

Diagram 4

Climate Change Knowledge

During this component the climate change knowledge gathered during Step Two is shared at a community meeting. Elders, community members and scientists present their climate change knowledge and the planner outlines climate change impacts and opportunities, based on the integration of IQ, science and community knowledge.

The planner also holds separate meetings with Elders, key community members and community organizations to discuss the impacts and opportunities. This component is completed during Visit 3 to the community.

Techniques:

- Community meeting
- Presentations
- Discussions with individuals and groups

COMMUNITY MEETING

- ✓ *Accessible location*
- ✓ *Community notice*
- ✓ *Radio advertising*
- ✓ *PowerPoint presentation*

Priority Risks and Opportunities

Based on the integrated climate change knowledge the planner completes a simplified risk and opportunity assessment. Each risk is considered separately in a table that outlines the expected frequency of the risk, the extent of damage and the cost of adaptation. A straightforward assessment is used, as the perception of risk is somewhat subjective. For frequency the variables are: rare, sometimes and often. For extent of damage the variables are: low, moderate and high. For adaptation costs the variables are: low, moderate and high. Opportunities are ranked by economic impact (low, moderate, high) and ease of implementation (easy, moderate, difficult).

The planner then takes this assessment to a community workshop, where the risks and opportunities are ranked in order of priority. Workshop participants use a process called "Dotmocracy" to select their climate change priorities. This component is also completed during Visit 3 to the community.

Techniques:

- Risk and opportunity assessment
- Community workshop
- Dotmocracy

Action Planning

A further community workshop determines the adaptation actions that will be recommended to deal with priority risks and opportunities. During this workshop participants suggest who should be the lead agency or department in implementing a recommended action.

If an action can be taken by the community, workshop participants will take the action planning process further. They will specify which additional individuals or organizations should be involved, what information should be collected, what community resources are required and what can be accomplished within a certain timeframe. The action planning component is also completed during Visit 3 to the community.

Techniques:

- Community workshop
- Action planning

WORKSHOP

- ✓ *Flip charts and paper*
- ✓ *Markers*
- ✓ *Coloured dots*

Draft CCAP

The planner is now in a position to prepare the Draft CCAP. While every community is different and may have a slightly different focus, a typical Draft CCAP has the following elements:

- Community profile which includes background information and climate change scenarios
- Analysis of climate change impacts, risks and opportunities
- Integration of priorities and recommended actions as well as recommended lead department or agency
- Summary table with 4 columns entitled: Risk/Opportunity; Adaptation Action; Priority; and Recommended Lead Agency or Department
- Action Plan for tasks to be accomplished by the community
- Appendix containing the brief overview reports for each community visit

A good example of a CCAP completed in 2010 is the Climate Change Adaptation Action Plan for the Hamlet of Arviat.

Once the Draft CCAP has been completed, the planner has to collect feedback from as many community members and local groups as possible. A special attempt should be made to get feedback from local Elders. This will involve one or two community meetings. The Draft Plan will be presented to the hamlet council for comment. This is also the time to present the Draft CCAP to appropriate GN departments in the community and at their head offices in order to generate preliminary comments on recommended actions. Feedback on the Draft CCAP is collected during Visit 4 to the community.

1558

Techniques:

- Community meeting
- Meetings with key community members
- Meeting with hamlet council
- Radio call-in show
- Meetings with appropriate GN departments in the community and at their head offices

Final CCAP

Preparing the final version of the CCAP is, again, the responsibility of the planner. Having listened to comments and concerns, the planner's professional judgement and experience will guide the revisions to be made. In the end, the planner has to be able to stand behind the plan.

During Visit 5 the planner presents the final CCAP to the community and to hamlet council.

Techniques:

- Community meeting
- Radio call-in show
- Hamlet council meeting

CIP Planning Teams 2009 - 2010

Distribution

Copies of the final CCAP will be distributed to the hamlet council, the departments and agencies recommended to lead the adaptation actions and other appropriate GN departments. The CCAP should be posted on the hamlet website, if one exists.

Since a lengthy planning document is expensive to produce in large numbers, the planner prepares a poster version of the final CCAP, which can be posted in community locations such as the hamlet office, the school(s), the supermarket, health centre, the HTO office, etc. This poster can also be reproduced as a flyer to be distributed to all households in the community. Like all of the materials used during the plan-making process, the final plan, poster and flyer have to be available in English and Inuktitut or Inuinnaqtun.

MATERIALS NEEDED

- ✓ *CCAPs (30)*
- ✓ *Posters (10)*
- ✓ *Flyers (one flyer for each household)*

Step Three Checklist

- ✓ *Climate change knowledge integrated*
- ✓ *Risk/opportunities assessment*
- ✓ *Priority ranking of risks and opportunities*
- ✓ *Action planning*
- ✓ *Draft CCAP*
- ✓ *Feedback on Draft CCAP*
- ✓ *Final CCAP*
- ✓ *Distribution*

Helpful Hints:

- Don't underestimate the fun and power of Dotmocracy

- The summary table and action plan are the heart of the CCAP

- Recommended actions should be grouped by theme and responsible department or agency

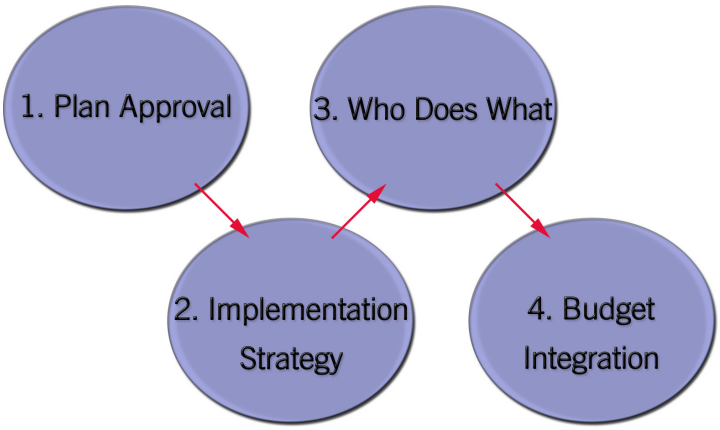
- Spread the word! Send a flyer to all households

STEP THREE RESPONSIBILITY: THE PLANNER

STEP FOUR - APPROVING THE PLAN

The four components of Step Four are shown below in Diagram 5.

Diagram 5



Approving and then implementing the CCAP are difficult steps and must be given as much thought and consideration as gathering knowledge and preparing the plan. If a plan can't be implemented, it has no life and sits on a shelf. Nunavut presents a challenge in plan approval. The Nunavut municipal structure determines that any plan approval must be a joint effort between the community, the council and the Government of Nunavut.

Plan Approval

A climate change adaptation plan lays out a long-term vision, a road map for adapting to climate change. Resources, both within the community and the GN, determine what can actually be accomplished and within what timeframe. The CCAP provides priorities and these must be harmonized with available resources and programs.

The CCAP is first adopted by hamlet council resolution. Different councils will have differing approaches to community notification, meetings and approval. The plan will have been widely circulated in Step Three. Formal approval indicates to the community that the hamlet council stands behind their Climate Change Adaptation Plan. This is the start, but just the start of the task of implementing the CCAP.

Implementation Strategy

Climate change has sweeping implications for communities and affects numerous departments and agencies. Following approval, a detailed implementation strategy and schedule needs to be prepared. This is a joint task for the hamlet and the GN. The hamlet would be represented by the SAO and/or the mayor. Representatives for the GN would vary depending on the priorities set out in the CCAP. A plan implementation team will be set up to consider:

- Hamlet climate change funding priorities set out in the CCAP
- What the community can do
- What the hamlet should be responsible for
- Role of the GN and its various departments
- Role of other agencies

Implementation of the CCAP will occur at several levels and over various timeframes. Not all implementation actions require new resources. The community can carry out some, others may be integrated into existing hamlet and GN programs. Many, however, will require coordination of existing programs and new resources, especially those involving infrastructure replacement or new construction.

Resources are limited in Nunavut. This is why an implementation team needs to be set up to determine what is feasible, what programs can be employed and what can be done from within the community itself.

The team will produce an implementation strategy, a projected budget and a time schedule for achieving the agreed upon actions. Once completed these will become an appendix to the CCAP.

Who Does What

The CCAP is developed as a "stand alone" plan. This allows sections of the CCAP to be implemented through various methods and feed into other plans and strategies.

One component of the implementation strategy is to assign responsibilities for the various actions. Climate change brings new challenges that lie outside current operations and mandates. The plan can lay these out, but all the players must sign on to do their part of the implementation strategy. Innovative thinking is required to determine "who does what and how". At the end of the discussion on "who does what" a chart assigning roles and responsibilities is prepared and agreed to.

Budget Integration

Creating a realistic budget for carrying out various actions is critical to the success of the CCAP. Resources need to be built into the budgets of both the hamlet and GN departments and other agencies. This may require new funds or reassignment of funds. Budget integration is the hardest part of action; it is also the most crucial to the success of the plan.

Being proactive always costs less than reacting to a climate change emergency

Step Four Checklist

- ✓ *Council resolution to approve CCAP*
- ✓ *Implementation team*
- ✓ *Implementation strategy*
- ✓ *Implementation timelines*
- ✓ *Who does what*
- ✓ *Budget integration*

Helpful Hints:

- All communities are different in their climate change adaptation needs, so expect differing implementation strategies

- Set up the implementation team immediately after the CCAP is approved

STEP FOUR RESPONSIBILITY: HAMLET COUNCIL AND GN

STEP FIVE - MONITORING AND REVIEW

Monitoring rounds out the Toolkit's 5-step process to climate change adaptation in Nunavut communities. The four components of Step Five are shown below in Diagram 6.

Diagram 6

Key Indicators

The work of laying out an implementation schedule, budget integration and responsibilities was accomplished in Step Four. These three aspects are the foundation for monitoring the CCAP. Vital to monitoring is the development of key indicators that specify the progress of the plan's implementation. For each implementation action indicators are developed that relate to the various steps that must be taken to ensure completion.

Since CCAPs will be different in each community so will the key indicators chosen. They reflect the stages in the completion of various implementation activities. In some communities it may be the progress of the completion of a piece of infrastructure, in others the development of a search and rescue program and in still others the protection of drinking water sources. Whichever the key indicator, it will relate to a priority action in the CCAP.

Milestones

Milestones refer to timing. Key indicators are planned to occur at certain times. The CCAP implementation strategy lays out timelines and milestones and lets the community assess if planned actions are occurring in a timely manner. While everyone can see when a piece of infrastructure is complete, there are numerous steps involved and monitoring milestones is an effective way to keep things on track.

Reporting

Some actions take considerable time. Indicators and milestones need to be reported. An annual report on the progress of implementing the CCAP helps the community know what's going on and lets people evaluate the success of the plan. The PLA, in consultation with the plan implementation team, should prepare this annual report.

Reviewing the Plan

Plans are dynamic and change should be expected. Gaps in original knowledge identified under the Three Pillars of Climate Change Knowledge will be filled and new information will become available. Climate change science is in flux and new information may require that some of the CCAP's impacts, risks and opportunities be revised. Implementation may move faster than expected.

The CCAP should be reviewed every five years to ensure it is up-to-date and that the implementation schedule is still relevant. This review would start with a community meeting to examine the annual progress reports and get input from scientists, Elders and community members. From this review meeting the status of the CCAP can be determined. Does it need a few minor adjustments or should a new CCAP be done. The review process should be led by the PLA in cooperation with CGS and the DoE.

Step FIve Checklist

- ✓ *Determine key indicators*
- ✓ *Indicate milestones*
- ✓ *Monitor timelines*

Helpful Hints:

- Hamlets will have unique key indicators

STEP FIVE RESPONSIBILITY: GN, HAMLET COUNCIL AND COMMUNITY

SUMMARIES

The Toolkit outlines the various components of the five Steps to Climate Change Adaptation in Nunavut. It also assigns responsibility for each step and describes the functions of the five visits to the community, the events that should take place during each visit and each visit's estimated duration.

This section of the Toolkit summarizes all of this information for easy reference.

Summary of Steps and Components

Detailed descriptions of the components of the five Steps to Climate Change Adaptation in Nunavut are provided in the Toolkit. The graph below summarizes the steps and their components.

STEP ONE – GETTING STARTED

- Initiating the Process
- Local Champion
- Time Required
- Agreement
- Communication

STEP TWO – BUILDING CLIMATE CHANGE KNOWLEDGE

- Scientific Knowledge
- Community Knowledge
- Elder Knowledge
- The Three Pillars

STEP THREE – PREPARING THE PLAN

- Climate Change Knowledge
- Priority Risks and Opportunities
- Action Planning
- Draft CCAP
- Final CCAP
- Distribution

STEP FOUR – APPROVING THE PLAN

- Plan Approval
- Implementation Strategy
- Who Does What
- Budget Integration

STEP FIVE – MONITORING AND REVIEW

- Key Indicators
- Milestones
- Reporting
- Reviewing the Plan

Summary of Responsibilities

Throughout the Toolkit responsibility for completing each of the five Steps to Climate Change Adaptation in Nunavut has been assigned to one or more individuals or organizations. This information is summarized in the chart below.

STEP	GN	PLANNER	COMMUNITY	HAMLET
ONE	X		X	X
TWO		X		
THREE		X		
FOUR	X			X
FIVE	X		X	X

Summary of Visits

Throughout the Toolkit community visits are referenced in various components of the five Steps to Climate Change Adaptation in Nunavut. The functions of each of the five visits and the events that should take place, as well as the estimated time required for each, are summarized in the graph below. The five visits should take place during all seasons of the year and should be spaced to maintain the momentum of the adaptation planning process.

VISIT 1 (STEP TWO)

Function	Events	Time Required
• Identify key community members • Meet with key community members • Meet with SAO • Identify Elders • Meet with Elders • Develop rapport in community	• Interviews with community members • Council meeting • Tea and bannock with Elders • Community walk-about with scientists • Community feast	• Four days in the community

VISIT 2 (STEP TWO)

Function	Events	Time Required
• Continue gathering community knowledge • Continue gathering Elder knowledge • Engage community	• Meetings with key informants • Tea and bannock with Elders • Community meeting	• Four days in the community

VISIT 3 (STEP TWO)

Function	Events	Time Required
• Present climate change knowledge to community • Discussion of impacts, opportunities and risks • Prioritization • Action planning • Continue discussions with Elders	• Community workshops • Informal discussions with Elders	• Four days in the community

VISIT 4 (STEP TWO)

Function	Events	Time Required
• Present draft plan • Feedback on draft plan • Discuss draft plan with Elders	• Community meeting • Meeting in school • Session with Elders • Meeting with key community members • Radio call-in show • Meetings with appropriate GN departments • Meeting with hamlet council	• Four days in the community • Two days at departmental head offices

VISIT 5 (STEP TWO)

Function	Events	Time Required
• Present final plan • Discuss final plan with Elders • Present to hamlet council	• Community meeting • Session with Elders • Council meeting • Radio call-in show	• Three days in the community

1568

MODEL HAMLET COUNCIL RESOLUTION

Moved by:

Seconded by:

Be it resolved that Hamlet Council agree to the development of a Community Climate Change Adaptation Plan in (name of hamlet).

GLOSSARY OF TECHNIQUES

The Toolkit suggests various techniques for accomplishing the tasks outlined in the 5-step adaptation planning process. Most are quite common and need no elaboration. However, some may not be so well known. A brief explanation of those is outlined in this Glossary. More detailed discussions of these techniques can be found in a variety of facilitators' handbooks. One useful handbook is: Sam Kaner, Facilitator's Guide to Participatory Decision-Making, New Society Publishers, Gabriola Island, BC, 1996.

Brainstorming
This technique is used to generate innovative ideas and involve all group members. It moves through three basic stages of idea generation, evaluation and selection. At the outset all ideas, no matter how "off-the-wall" they may seem, are accepted and recorded. No criticism is allowed at this stage. In the next stage ideas are evaluated and combined to produce a limited number of viable ideas. Finally, the viable ideas are ranked in priority order.

Dotmocracy
This technique is used to prioritize issues or actions and involve all group members. It is very useful in large groups or workshops. First, a list of issues or actions is compiled on flip chart paper and taped to the wall. Each participant is given a number of coloured sticky dots, usually ten. Participants "vote" by sticking their dots besides the ideas they like the best. In effect they vote with dots, hence dotmocracy. When the dots are added up a priority list of issues or actions has been created.

Key Indicators
This technique is used to assist in monitoring implementation of a plan or action. It sets out specific and measureable items that indicate progress towards completion. For example, in building a rink some indicators might be; plans finalized, contractor hired, foundation poured, walls erected, etc.

Key Informant Process
This technique is used to identify members of a community with specific types of knowledge that is valued by many. It starts by asking a few community members chosen at random who they would talk to, if they wanted to know about or seek advice on climate change. Certain names will be suggested by several people. These become the key informants. The initial key informants may also suggest further names.

Milestones
This technique is used to monitor the time required to implement recommended actions. For each of the key indicators a timeframe is estimated. The completion of a key indicator then becomes a milestone. What is monitored is whether or not the key indicator was completed on time.

Risk and Opportunity Assessment
This technique is used to evaluate priorities for action in adapting to climate change impacts. There are various approaches to risk and opportunity assessment and some are very detailed and technical. The Toolkit uses a simplified assessment process that can be employed at the community level. A straightforward three level ranking system is employed.

Impacts are ranked under the categories of expected **frequency** (classified as rare, sometimes and often), **extent of damage** (classified as low, moderate or high) and **adaptation cost** (classified as low, moderate or high). Impacts can then be prioritized based on an assessment of these three variables.

Opportunities are ranked under the categories of **economic impact** (classified as low, moderate and high) and **ease of implementation** (classified as easy, moderate or difficult). Opportunities can then be prioritized based on an assessment of these two variables.

Scenario Building

This technique is used to paint a picture of what the climate will be like in an area at various points in the future. Climate change scenarios usually work in longer timeframes, possibly 25, 50 and 100 years. General climate data on temperature, precipitation, wind and ice conditions are used in models to suggest future climate conditions. These future climate conditions for the community become the base information for determining impacts.

GLOSSARY OF ACRONYMS

ACIA	Arctic Climate Impact Assessment
CCAP	Community Climate Change Adaptation Plan
CGS	Community & Government Services Department
CIER	Centre for Indigenous Environmental Resources
CIP	Canadian Institute of Planners
CLEY	Department of Culture, Language, Elders and Youth
DFO	Department of Fisheries and Oceans
DoE	Department of Environment
GN	Government of Nunavut
HTO	Hunters and Trappers Organization
INAC	Indian and Northern Affairs Canada
IPG	Institute of Public Governance
IQ	Inuit Qaujimajatuqangit
NCCP	Nunavut Climate Change Partnership
NGMP	Nunavut General Monitoring Plan
NIRB	Nunavut Impact Review Board
NPC	Nunavut Planning Commission
NRCan	Natural Resources Canada
NTI	Nunavut Tunngavik Incorporated
PLA	Planning and Lands Administrator
SAO	Senior Administrative Officer

Court of Appeal File No.: **C65807**

IN THE MATTER OF A REFERENCE to the Court of Appeal pursuant to section 8 of the *Courts of Justice Act*, RSO 1990, c. C.34, by Order-in-Council 1014/2018 respecting the constitutionality of the *Greenhouse Gas Pollution Pricing Act*, Part 5 of the *Budget Implementation Act, 2018, No. 1*, SC 2018, c. 12

COURT OF APPEAL FOR ONTARIO

Proceedings commenced at Toronto

RECORD OF THE ATTORNEY GENERAL OF ONTARIO

VOLUME III OF IV

THE ATTORNEY GENERAL OF ONTARIO
Civil Law Division
Constitutional Law Branch
720 Bay Street, 4th Floor
Toronto, ON M7A 2S9

Josh Hunter / Padraic Ryan / Thomas Lipton
LSO Nos.: 49037M / 61687J / 60766V
Tel.: (416) 326-3840/ (416) 326-0131/ (416) 326-0296
Fax: (416) 326-4015
E-mail: joshua.hunter@ontario.ca /
padraic.ryan@ontario.ca /
thomas.lipton@ontario.ca

Counsel for the Attorney General of Ontario

Fax to: (204) 984-8495
Email to: sharlene.telles-langdon@justice.gc.ca