



PRINCE EDWARD ISLAND

Recommendations for the Development of a Climate Change Mitigation Strategy



Submitted to: **PRINCE EDWARD ISLAND,
DEPARTMENT OF COMMUNITIES, LAND AND ENVIRONMENT**

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TABLE OF CONTENTS

INTRODUCTION	1
CLIMATE CHANGE MITIGATION AND THE PROVINCIAL ENERGY STRATEGY.....	1
CARBON PRICING	2
CLIMATE CHANGE MITIGATION AND WHY IT MATTERS.....	4
BUILDINGS AND FACILITIES.....	9
ENERGY EFFICIENCY AND CONSERVATION.....	9
HOME AND INSTITUTIONAL HEATING	9
CODES AND STANDARDS.....	11
EMISSIONS REDUCTIONS.....	11
FOOD AND FARMING.....	12
CROPLAND MANAGEMENT.....	13
<i>Cropland Nutrient Management.....</i>	<i>13</i>
<i>Conservation Cropping / Low Tillage</i>	<i>14</i>
LIVESTOCK MANAGEMENT	15
<i>Reducing GHGs Related to Cattle Feeding Practices.....</i>	<i>15</i>
<i>Emissions Reductions from Dairy Cattle.....</i>	<i>15</i>
MANURE MANAGEMENT.....	16
<i>Anaerobic Digestion</i>	<i>17</i>
LONGER-TERM CONSIDERATIONS	17
<i>GHG Reduction Through Better Cattle Genetics</i>	<i>18</i>
<i>Vaccines</i>	<i>18</i>
<i>Seaweed as Feedstock</i>	<i>18</i>
EMISSIONS REDUCTIONS.....	18
FORESTRY POLICIES.....	19
FOREST MANAGEMENT	20
<i>Forest Enhancement Program Awareness</i>	<i>20</i>
<i>Carbon Sequestration</i>	<i>20</i>
LANDSCAPE CONVERSION	22
<i>Converting Abandoned Agriculture to Forest.....</i>	<i>22</i>
<i>Decreasing Forest to Agricultural conversion</i>	<i>23</i>
EMISSIONS REDUCTIONS.....	24
MOVING PEOPLE AND GOODS.....	25
EMISSIONS REDUCTIONS.....	28
MAKING DECISIONS AND FURTHERING PROVINCIAL GOALS.....	28
LEADING THE WAY.....	30
APPENDIX A: SUMMARY OF FEEDBACK	31
APPENDIX B: ESTIMATED GHG REDUCTIONS	37

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INTRODUCTION

The Government of Prince Edward Island understands the need for all provinces and territories in Canada to play their part in mitigating, or reducing, the harmful impacts of climate change. As part of this understanding, the Provincial Department of Communities, Land and Environment has tasked Dunsky Energy Consulting with submitting recommendations to assist the Environment Division in developing a Provincial Climate Change Mitigation Strategy.

To develop this document, Dunsky Energy Consulting and our partners, the Delphi Group and Envint Consulting, held interviews and discussions with multiple stakeholders and developed an initial draft document to encourage public discussion. Members of the public were able to submit feedback on the draft, released to the public in October 2016, in the following ways:

- Individuals and representatives of public-interest groups attended public consultation sessions held around the province between November 7 and 10, 2016.
- Individuals, groups, organizations, businesses, and others submitted written feedback on the Government's Climate Change Strategy website (<https://www.princeedwardisland.ca/en/service/climate-change-mitigation-strategy-public-consultation>).

Based on the public consultations and feedback, including feedback provided by Government, we have revised our recommendations accordingly.¹

Please note that this report focuses on climate change mitigation (reducing greenhouse gas emissions) rather than climate change adaptation (taking action to prevent or minimize damage resulting from climate change). Prince Edward Island (PEI) will still need to address the impacts of climate change - the consequences of emitting greenhouse gas (GHG) emissions over the last several hundred years cannot be avoided. We note that the Provincial Government is developing a separate Climate Change Adaptation Strategy that will address this area. For simplicity, however, **when we refer to Climate Change in this document, we are referring to Climate Change Mitigation unless we indicate otherwise.**

CLIMATE CHANGE MITIGATION AND THE PROVINCIAL ENERGY STRATEGY

The Provincial Government understands the key linkages between energy and climate change: our production and consumption of energy is a key factor in the impacts we have on the planet. For this

¹ Emission reduction wedge diagrams in this report were created using Delphi Trident®, a carbon and energy management and tracking tool developed by The Delphi Group. For more information, please see <http://delphi.ca/tools-products/delphi-trident/>.

reason, the draft climate change recommendations include some overlap with the Provincial Energy Strategy, to which many Island residents and organizations contributed input and considerations.

This overlap is deliberate: we cannot mitigate the harmful effects of climate change if we ignore our energy systems, and changes to those systems must be reflected in the actions we take to mitigate climate change. However, the Energy Strategy outlines many of the actions needed to make PEI's energy system, both electric and non-electric, more efficient, sustainable and renewable, whereas this document focuses more on the calculation of greenhouse gas emissions and on additional sectors that would help Prince Edward Island to meet its obligations and goals in reducing them. The two documents are intended to support and mutually reinforce each other, rather than duplicate work.

One key difference between the Energy Strategy and this report is that the Energy Strategy includes recommendations to reduce emissions both locally and in New Brunswick, while **this document focuses on local emissions reductions only**. Much of the electricity used in Prince Edward Island is generated in New Brunswick, and the emissions from generation are attributed to New Brunswick in federal and provincial reports. So, actions taken to save electricity and switch to more renewable sources do not directly impact the emissions accounted for by Prince Edward Island.

Reducing emissions is the critical outcome, regardless of who accounts for them. However, from the perspective of reporting on emissions reductions, we cannot include these actions in an Island-based Strategy. If we did, two provinces would be counting them, and we need to align with federal reporting standards, which only allow one province to do so. Regardless of who accounts for them, however, PEI is attempting to reduce its imports by increasing its use of local, renewable sources of energy, which would lower global GHG emissions. Mitigating climate change requires a global way of thinking, so ignoring these important actions simply because PEI cannot account for them would be counterproductive, and there are many other benefits as well, including greater security over energy prices and local job creation. If this focus on renewables continues, the Island will continue to reduce the GHGs resulting from electricity use, regardless of whether or not it is able to include the associated reductions within its own targets.

For these reasons, we do not focus on electricity emissions reductions in this document. In other areas, such as non-electric heating, an eventual Climate Change Mitigation Strategy will include some actions that are also included in the Energy Strategy, to maintain the intended alignment. However, the focus here will be addressing the overall contribution to GHG reductions that each action would take.

CARBON PRICING

Carbon pricing refers to a method of reducing GHG emissions by charging those who emit carbon dioxide. The carbon price is the amount that must be paid for emitting one tonne of carbon dioxide into the atmosphere. Developing a model that accounts for the cost of carbon is not part of this document. It is, however, an important consideration in mitigating the effects of climate change for several reasons:

- It can provide a source of investment into mitigation activities;
- It can encourage individuals and businesses to invest in reduced-carbon or carbon-neutral options; and
- It sends a price signal to the market that more sustainable and renewable options are more appropriate choices for the future.

In Summer 2016, we asked Islanders if they thought the Government should examine a carbon pricing model, and if so, what kind. The majority of respondents indicated their support for a model that included a cost for the continued use of carbon, as long as it was revenue neutral.

Since that time, the Federal Government has ratified the Paris climate accord, and on October 3, 2016, announced a national proposal for carbon pricing. The federal proposal does not prescribe the exact form of carbon pricing that must be adopted by the provinces. It does, however, include several components that impact provincial decisions:

- Provinces have until 2018 to establish a carbon pricing model; if they do not, the Federal Government will impose a price schedule for each province that does not implement a model (beginning at \$10/tonne in 2018 and rising \$10 per year until it reaches \$50/tonne in 2022), with all revenues being returned to the province from which it is collected.
- Provinces without an existing carbon pricing model (including Prince Edward Island) can select a carbon levy or cap-and-trade system, but this must be implemented no later than 2018.
 - If Prince Edward Island selects a carbon levy, it must match or exceed the federal carbon pricing schedule. At a minimum, it must cover a broad base of emissions totalling approximately 70% of total emissions, with excluded amounts likely including emissions produced by agriculture, decaying garbage in landfills, or industrial emissions not related to the burning of fossil fuels.
 - If the Island selects a cap-and-trade system, the reduction targets must be equal to or greater than 30% below 2005 levels by 2030 (this aligns with the federal target).

During public consultations, the feedback we received generally indicated that revenues obtained from a carbon-pricing model should be returned to Island residents and business in the form of programs and sustainable solutions, which differed from the feedback received in the summer.

Revenue neutrality (as preferred by those who commented in the summer) and carbon funds being used for programs and services (as preferred by those during public consultations) are two different implementation models. Because our task was to develop a mitigation strategy, we did not engage with Islanders on a deeper level to determine if respondents realized the differences and had changed their perspective or if it was a result of different individuals providing feedback. We also didn't pursue an overall determination of a specific preferred option. We did provide all feedback to the Province for their use in developing a carbon-pricing model.

For the same reason as indicated above, we have not developed a carbon-pricing model within this document. We do, however, recognize that the federal announcement has implications for the Island, depending on the system implemented. Regardless of the specific system implemented, however, the

recommendations contained in this report should benefit from a carbon-pricing model through increased focus on, and potentially funding for, climate change mitigation. We do not expect that they would change based on a particular model pursued in the province.

CLIMATE CHANGE MITIGATION AND WHY IT MATTERS

Climate change is a reality. Greenhouse gas emissions resulting from how we heat and power our homes, businesses, and industries; how we travel and move goods; how we run our farms; and how we manage our waste; as well as other activities, have been demonstrated to drive climate change. We are already seeing the impacts, and we will continue to do so: rising temperatures, variable rainfall and snowfall patterns, rising sea levels, and others. Provinces and territories across Canada and other countries around the world are facing the same challenge we are: how do we reduce these negative impacts?

Climate change is not a new topic on the world stage. In fact, the Intergovernmental Panel on Climate Change (IPCC), the leading international body for the assessment of climate change, was established almost 30 years ago, in 1988. Thousands of scientists from all over the world contribute to the work of the IPCC, with the purpose of providing a clear scientific view on the current state of knowledge in climate change and its potential environmental and socio-economic impacts. In its *Fifth Assessment Report*, published in 2013, the IPCC states that it is extremely likely [which the IPCC defines as 95-100% probability] that human influence has been the dominant cause of the observed warming since the mid-20th century.²

The Federal Government, with the provinces and territories, has developed *The Pan-Canadian Framework on Clean Growth and Climate Change*, which is the Government's "plan to grow our economy while reducing emissions and building resilience to adapt to a changing climate".³ Prince Edward Island was involved in development of the pan-Canadian framework, which will, along with this document, inform the development of a provincial plan to reduce GHGs.

Regionally, the six New England states and the five Eastern Canadian provinces, known as the New England Governors' and Eastern Canadian Premiers (NEGECPP), have joined together in annual conferences and joint committees to discuss issues of regional concern. In 2015, the group developed voluntary targets

² *Pan-Canadian Framework on Clean Growth and Climate Change: Canada's Plan to Address Climate Change and Grow the Economy*. Cat. No.: En4-294/2016E-PDF. 2016. Foreword.

³ Communiqué of Canada's First Ministers, 3 March 2016, Vancouver, British Columbia
<http://pm.gc.ca/eng/news/2016/03/03/communique-canadas-first-ministers>

to reduce emissions by 35–45% below 1990 levels by 2030.⁴ Prince Edward Island has signed on to this agreement and the Government is committed to playing its part.

Reducing GHGs or “climate change mitigation”, according to the United Nations Environment Programme, refers to:

[E]fforts to reduce or prevent emission of greenhouse gases. Mitigation can mean using new technologies and renewable energies, making older equipment more energy efficient, or changing management practices or consumer behavior. It can be as complex as a plan for a new city, or as simple as improvements to a cook stove design. Efforts underway around the world range from high-tech subway systems to bicycling paths and walkways. Protecting natural carbon sinks like forests and oceans, or creating new sinks through silviculture [forestry management practices designed to meet diverse needs] or green agriculture are also elements of mitigation.⁵

Climate change mitigation involves everyone, including Government, the public and private sectors, and individual citizens, working to adjust our thinking and activities to reduce the extent to which we contribute to climate change. By making changes now, Prince Edward Island will work towards a more sustainable future.

When these adjustments are made, **Prince Edward Island will be moving towards a low-carbon economy** (one that has a minimal output of GHGs). **This is important to ensure that Prince Edward Island remains competitive in the global marketplace.** Because of the national and global efforts to combat climate change, the world will be moving towards a low-carbon economy, and PEI needs to move there as well to remain competitive in the longer term.

HOW WILL THIS BE DONE?

The Government of Prince Edward Island has already started to take action in a number of ways. The Province has developed on-island wind power to generate electricity more sustainably and reduce electricity imports, making PEI the wind power leader in Canada on a per-capita basis. Efficiency PEI (formerly the Office of Energy Efficiency) offers programs and incentives that help reduce the energy you use to heat your homes and businesses. But there is much more to do.

There are many ways to reduce greenhouse gas emissions. This includes changing behaviours, infrastructure and energy-use decisions, and social policies. In reality, a mix of voluntary and required changes will likely have the greatest impact on results. This document is designed to outline the mix of

⁴ Resolution 39-1, 39th Annual Conference of New England Governors and Eastern Canadian Premiers, Aug. 30-31, 2015.

⁵ United Nations Environment Programme. *Climate Change Mitigation*.
<http://www.unep.org/climatechange/mitigation/Home/tabid/104335/Default.aspx>

recommended actions the Government can take over the next fifteen years to lower provincial emissions to a level that reduces the impacts of climate change.

Throughout 2016, Dunsky Energy Consulting and the Provincial Government gathered information and input from Islanders to understand the actions they think are needed to mitigate climate change. Through discussions with First Nations groups, stakeholder representatives, and Government departments, and through online feedback and public consultations, we gathered a range of perspectives on what should be done.⁶ We then revised our original draft document to incorporate this input and feedback. A summary of all feedback received is provided in Appendix A.

The recommended actions outlined in this document are designed to meet aggressive GHG reduction targets, as supported by Islanders who submitted input into the development of a Strategy. Specifically, we recommend Prince Edward Island work to reduce emissions levels to at least 35-45% below 1990 levels by 2031, which is a decrease of approximately 690,000-880,000 tonnes from the 1990 level of approximately 2 million tonnes. This target aligns with the NEGECP's voluntary goal and is an ambitious one that will require province-wide action.

The recommendations currently outlined in this initial draft document would reduce emissions levels to 39.1% below 1990 levels by 2031⁷ (not 2030 as set in the NEGECP voluntary goal), which allows for 15 years of activity. This is more ambitious than the federal target of reducing GHG emissions 30 percent below 2005 levels by 2030, demonstrating PEI's leadership role in climate change mitigation.⁸ Details of the individual reductions estimates that total this amount are included throughout this report and summarized in Appendix B. However, to ensure our recommendations are reasonable and achievable, we have been conservative in our analysis. We believe the target can be met by 2030 if some of the actions we have recommended are pursued earlier or achieve higher results than calculated, and as new opportunities arise in the future. This target also allows some room in case emissions in the absence of activity are higher than forecasted by Environment Canada. For PEI's final Mitigation Strategy to succeed, support from all areas of the province is key. We have attempted to garner initial support by incorporating Islanders' knowledge and thoughts throughout the development process, but continuing work in this area will be required.

To meet this target, **we have conducted an analysis with three components:**

- Calculations of emissions reductions based on PEI-specific data, that include **results that are quantifiable with straightforward assumptions**. Examples include energy efficiency, programs for adopting electric vehicles, conservation cropping, forestry initiatives, etc.

⁶ Comments from Islanders can be found on the Climate Change Mitigation Strategy website: <https://www.princeedwardisland.ca/en/information/communities-land-and-environment/climate-change-mitigation-strategy-public-consultation>

⁷ This reduction includes 10% reduction already forecasted to be achieved in the absence of a new strategy.

⁸ The Federal Government has indicated this target is a "floor".

- Calculations of conservative emissions reductions based on programs that have been conducted elsewhere for which we have applied adjustments for PEI, but for which actual **results are heavily dependent on detailed program design and delivery**. Examples include behaviour-based programs and culture changes for transportation, as well as codes and standards.
- Considerations and recommended actions which would result in emissions reductions, but that we are not able to quantify in a conservative or appropriate manner. It is important to note that emissions reductions would occur and the associated actions should therefore be considered; we are just unable to quantify the potential impact.

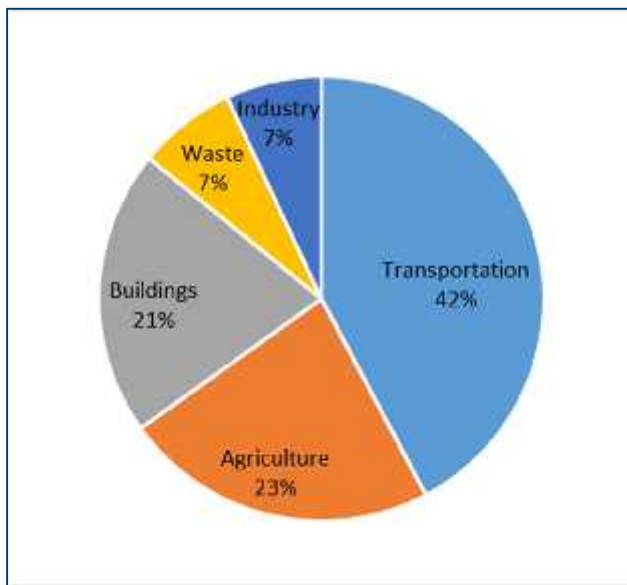
We have indicated the three types of analyses where applicable throughout this report by using the following terms:

- **“Would”** or **“could”** (for straightforward, quantified calculations);
- **“May”** (for highly variable and conservative, quantified estimations); and
- Providing **qualitative descriptions** for additional options for which assumptions are too ambitious or difficult to quantify.

CONTEXT AND STRUCTURE

As of 2014, Prince Edward Island’s emissions came from the following sources:

Figure 1. 2014 PEI Emissions Breakdown⁹



⁹ Environment and Climate Change Canada, 2016. Economic Sector Tables by Province and Territory. *National Inventory Report*. <https://www.ec.gc.ca/ges-ghg/default.asp?lang=En&n=83A34A7A-1>

Most of these emissions come from three sectors: transportation, agriculture, and buildings. And it is important to note that emissions in some of these areas, including agriculture and buildings, have declined since 1990. To achieve the recommended target reductions, however, current efforts must continue and new ones be adopted:

- **Buildings and facilities:** The way the built environment is designed, heated, and operated influences how much energy is used. Most of this energy is not renewable and generates greenhouse gas emissions. Buildings and facilities need to move towards lower-carbon energy sources and greater energy efficiency to make them as sustainable as possible.
- **Food and farming:** How food is grown, delivered, and consumed impacts emissions. Making choices that optimize food and farming practices while reducing emissions would help to meet the reduction targets.
- **Forestry management:** How we manage our forests impacts the emissions released into the atmosphere. Trees are an excellent source of carbon sequestration (storage), and they are a key part of the way forward.
- **Movement of people and goods:** Transportation is the biggest source of GHG emissions, and the emissions from this sector continue to grow each year. Reducing emissions from transportation will mean changing how Islanders travel, in terms of the vehicles used, the way they are used, and how communities and transportation systems are designed.
- **Making decisions and furthering PEI's goals:** Things are changing quickly around the world. The recommended actions included in this document would lead to GHG reductions, and these reductions can be estimated. However, it is impossible to develop policies to address every future scenario or new technology. Instead, future decision-making processes must consider policies and actions that ensure the best future for all.

The recommended actions highlighted in this document all have additional benefits besides GHG reductions. For example, energy efficiency improves comfort and reduces costs, many of the agriculture options help to improve water quality and aquatic ecosystem health, and transportation options improve air quality. While we focus on the GHG reduction opportunities, we cannot lose sight of the additional benefits included in the decisions that are made, which is why some of the actions in the *Making Decisions and Furthering PEI's Goals* section address these points specifically.

We are recommending actions that have a range of GHG reduction impacts. Some are quite small but may align with other Provincial strategies and goals. Others may allow flexibility or options in reaching an even higher target in the future. Yet others were the result of public feedback that provide opportunities for achieving engagement and support from Islanders. For these reasons, these small-impact recommendations remain in our document so the Province has the relevant information on which to base policy decisions.

BUILDINGS AND FACILITIES

Many of the buildings in Prince Edward Island were built without the knowledge that exists today about energy efficiency and other ways to reduce the amount of non-renewable energy required to heat and run them. Because over half of Islanders still heat with fuel oil,¹⁰ applying this knowledge to the existing and new building stock would reduce GHG emissions.

RECOMMENDED ACTION

By 2020, reduce the use of non-electric energy by 2% each year.

ENERGY EFFICIENCY AND CONSERVATION

Currently, programs and incentives offered by Efficiency PEI reduce home heating fuel use by about 1.1% each year, or about 1.5 million litres.¹¹ However, GHG emissions can be reduced even further through a greater focus on reducing home heating fuel use, particularly by offering programs that help Islanders make their homes and businesses more energy efficient and providing assistance for switching to more sustainable sources of heat. If a comprehensive set of programs is developed and existing programs expanded, it is possible for the Island to achieve energy savings of 2% of fuel use each year by 2020. A target of 2% would make PEI among the leaders of energy efficiency (but not as aggressive as some)¹² and reduce dependence on non-local sources of energy such as fuel oil.¹³

HOME AND INSTITUTIONAL HEATING

Making buildings more energy efficient is the most cost-effective and important first step in reducing fossil-fuel-based energy use. But it cannot be the only step. Additional activities such as switching to more sustainable fuel sources must also be pursued. We therefore recommend the development of a fuel-switching program by either the Provincial Government or the new energy efficiency utility. This program would support residents and businesses in switching from oil heat to other forms of heating systems such as heat pumps, electricity, and/or wood:

- **High-Efficiency Heat Pumps:** Heat pumps (air- and ground-source) absorb heat from their surroundings and distribute it throughout a home, and they can reduce heating costs from between 30-50% based on current rates. They also use electricity rather than oil, which is a more

¹⁰ Government of Prince Edward Island. *Prince Edward Island Home Heating Survey 2014*. June 2014.

¹¹Data provided by Efficiency PEI.

¹² *Prince Edward Island 2016 Provincial Energy Strategy Background Document*.

¹³ Additional details regarding electrical fuel sources can be found in the Prince Edward Island Provincial Energy Strategy.

sustainable fuel due to the Island's impressive wind supply and has fewer emissions due to the mix of fuels used in imports from New Brunswick.

- **Electric Heat:** Heat pumps do not operate at extremely low temperatures, so they require a back-up heat source. As PEI's electric system becomes more renewable, switching the back-up system to electric from oil would reduce GHGs and can reduce insurance costs.¹⁴
- **Biomass Heat:** For those homes for which electric heat is undesirable, and to reduce negative impacts from extensive conversion to electric heat, wood heating is also an option, as it is a carbon-neutral fuel option.¹⁵ Support for new programs that encourage CPA and EPA-certified biomass heating systems (which meet provincial air quality standards) include incenting pellet central heating and pellet stoves in the residential and business sectors and wood chips in additional public buildings on the Island. It is important, however, that this be done in a way that supports sustainable forestry practices so we avoid increasing the amount of carbon we emit as a result of deforestation. To ensure wood chips delivered to governmental facilities are sustainably harvested, the government has a policy in place that requires fuel wood to be sourced from sustainably managed forests. Pellets would need to be imported from the Maritimes in the near term, but can be included in the sustainable management practices over time as local demand developed. The actions would help to reduce emissions by another 5% beyond the efficiency and fuel-switching options highlighted above, even including the additional emissions from importing pellets.

Between efficiency and fuel switching, the private, public, and residential sectors all have a role to play in reducing GHG emissions, and these actions would assist them in doing so. Efficiency would reduce emissions by over 138,000 tonnes (7% from 1990 levels), and fuel switching by another almost 93,000 tonnes (almost 5% from 1990 levels).

RECOMMENDED ACTIONS

- Develop a fuel-switching program for residents and businesses that encourages them to stop using non-renewable heating fuels.
- Install up to an additional 40 biomass heating systems at provincial and other public facilities.
- Develop a strategy to implement large wood pellet heating systems at Government facilities.
- Incent the installation of CSA- or EPA-certified wood pellet boilers and furnaces in commercial and residential buildings.

¹⁴ The 2016 Provincial Energy Strategy addresses implications of this option on electricity demand.

¹⁵ Calculations are based on wood heat, but other biomass options could be explored. The wood releases carbon into the atmosphere when burned; however, it would do so when it naturally decayed as well. So while burning the wood accelerates the release of carbon, it does not increase it.

CODES AND STANDARDS

The Province is currently in the process of adopting the National Building Code and the National Energy Code for Buildings (2015) across the entire Island. To meet GHG reduction goals, however, efforts must go further than this. The Energy Strategy therefore suggests the establishment of a “stretch” provincial building code that would raise the baseline energy performance of all new construction beyond that specified in the national codes as well as provincial contributions to the development of national standards for relevant non-electric appliances and equipment such as furnaces and water heaters. Between the application of the National Codes, a Provincial stretch code and associated programs such as building labelling, a minimum of an additional 0.4% (9,300 tonnes) of emissions reductions may be achievable.

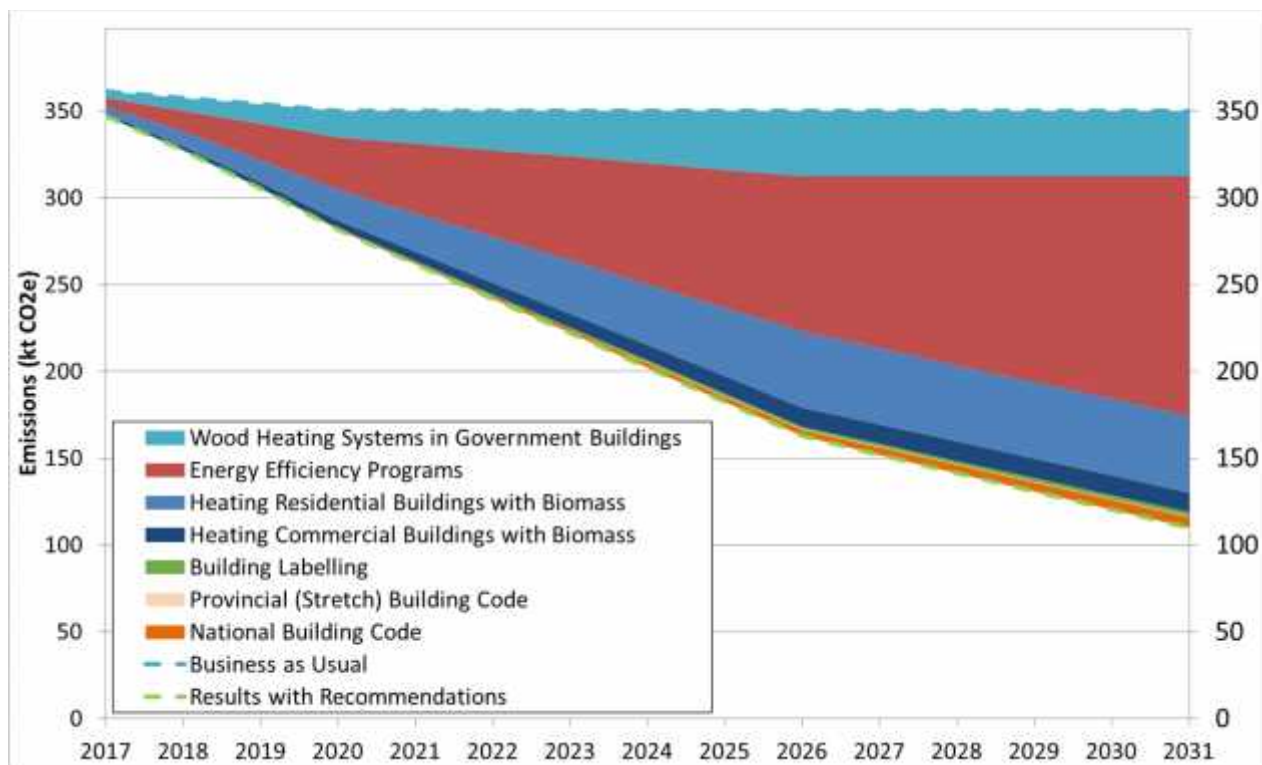
RECOMMENDED ACTIONS

- Develop a “stretch” provincial building code to raise the baseline performance of all new construction beyond that specified in the national codes.
- Contribute to the development of national standards for non-electric appliances and equipment.
- Consider developing a mandatory building energy labelling program.

EMISSIONS REDUCTIONS

The actions highlighted above could reduce provincial emissions by over 240,000 tonnes, or over 12% from 1990 levels, by 2031. Energy efficiency and fuel switching is, therefore, a critical part of reducing overall emissions, and it is one area in which every household and business, as well as Government facility, is able to play a role.

Figure 2. Buildings and Facilities Emissions Reductions



FOOD AND FARMING

Prince Edward Island has a long and significant history of fishing and agriculture. Over the last 30 years, the aquaculture sector has also grown. As with all sectors, these contribute to GHG emissions and efforts to do this work more efficiently, more sustainably, and more appropriately for the future must be considered.

The recommendations detailed below focus on the agriculture sector, rather than the fishing and aquaculture sectors. Our research indicates that fisheries and aquaculture have a lower contribution to overall emissions, so the actions that can be taken by that sector have correspondingly fewer reduction opportunities. **Work should nevertheless continue with these sectors to determine the most appropriate options to pursue in the future.**

Agriculture is of particular interest for climate change mitigation because, in addition to carbon dioxide (CO₂) emissions, agricultural activities result in significant emissions of two greenhouse gases – methane (CH₄) and nitrous oxide (N₂O) – that are many times more potent than carbon dioxide at trapping energy in the earth’s atmosphere:

- Methane is naturally produced in the digestive systems of cattle and other livestock via a process called enteric fermentation and also as manure decomposes under low-oxygen (anaerobic) conditions.
- Nitrous oxide is released when nitrogen-based fertilizers break down after application.
- Soils also store large quantities of carbon dioxide, which can either be emitted or absorbed depending on agricultural practices.

For these reasons, the actions taken in this sector, as with every section in this document, make important contributions in meeting overall GHG reduction targets.

CROPLAND MANAGEMENT

Cropland management refers to the consideration of how soil is used and the way it is farmed. PEI farmers have already taken many actions to improve the efficiency of their operations. It is a complex area with many considerations, but we would be remiss if we did not examine opportunities for reducing GHGs, including the recommended action items listed here.

CROPLAND NUTRIENT MANAGEMENT

Adding nitrogen fertilizer to cropland helps to achieve higher crop yields and is an important element of agriculture practices today. But there are ways it can be used more sustainably. Adopting an integrated set of Beneficial Nitrogen Management Practices for annual cropping systems can reduce nitrous oxide (N₂O) emissions.

In recent years, farmers, watershed groups and the fertilizer industry have been implementing and studying the impacts of 4R Nutrient Stewardship. These practices consider the 4R (Right Source at the Right Rate, the Right Time and the Right Place) Nutrient Stewardship Plan:

- **Right Source** focuses on **matching** fertilizer types to crop needs.
- **Right Rate** matches the **amount** of fertilizer needed by specific crops and/or soils.
- **Right Time** makes nutrients available **when** crops need them.
- **Right Place** keeps nutrients **where** crops can use them rather than applying them where they are not required.

Policies and programs should be developed to assist farmers in incorporating these practices into their agriculture practices, which can have multiple benefits such as saving them time and money, increasing yields, reducing emissions, and improving water quality. Examples of programs include training and testing, loans, challenges with rewards, financial incentives, and cost-sharing. To be truly effective, however, these programs must be developed in collaboration with the sector, so the first step would be initiating discussions with key stakeholders.

Another option is to encourage the planting of alternative potato varieties that are more fertilizer efficient, such as the Prospect potato.

Effective programs would reduce emissions by 7,700 tonnes below 1990 levels, with an additional 8,100 tonnes of reductions achieved through increased planting of alternative potato varieties, for a total reduction of 0.8%.

CONSERVATION CROPPING / LOW TILLAGE

Conservation cropping is an agricultural method that minimizes soil disturbance, involves early planting, stubble retention (retaining the parts of a plant after seeds have been harvested to reduce wind and water erosion), and crop rotations. Shifting from conventional cropping to conservation cropping can increase the amount of carbon that stays in the soil rather than being released into the air. Some Island farmers have been involved in conservation cropping for years, to help manage the soil, increase yields, and improve the health of farmland. Going forward, these efforts need support and assistance to ensure they are implemented province-wide.

Conservation cropping also results in fewer passes on a farm field, which reduces fossil fuel emissions from farm equipment, further helping to lower GHG emissions.

For this reason, investments should be made in education and training opportunities for the agriculture sector to assist them in transitioning to conservation cropping methods. As part of the training programs, assessing opportunities for additional support and/or programs should be included.

In addition to the benefits of reduced GHGs from conservation cropping (which would reduce emissions by over 1% or 21,000 tonnes), it reduces production costs, improves soil structure and water retention, and reduces soil erosion, all of which are beneficial to farmers, the environment, and can lead to greater yields.

RECOMMENDED ACTIONS

- In consultation with the agriculture sector, develop and implement programs to increase the implementation of 4R Nutrient Stewardship practices.
- Develop appropriate incentives and/or support to encourage the planting of alternative potato varieties that are more fertilizer efficient.
- Invest in education and training opportunities to assist the sector in transitioning to conservation cropping methods.

LIVESTOCK MANAGEMENT

REDUCING GHGS RELATED TO CATTLE FEEDING PRACTICES

Innovative feeding practices and management strategies for cattle can be implemented to increase feed-use efficiency in cattle. By increasing feed-use efficiency, beef and dairy farm productivity can be improved, reducing GHGs from enteric fermentation and manure per amount of beef or milk produced. Both of these impacts of cattle are significant contributors to emissions from agriculture and therefore an important component of a mitigation strategy.

Over the course of the development of a Climate Change Mitigation Strategy, the Province should work with agricultural associations and farms to implement innovative strategies to increase efficiencies. Examples include:

- **Performance tracking and cattle sorting improvements:** Examining the feasibility of implementing individual animal performance tracking and improved sorting for customized feeding by animal grouping.
- **Feeding strategies:** The addition of feed components to cattle's diet that inhibit uptake of hydrogen by rumen methanogenic bacteria (such as fats, oils, and others) works to suppress enteric methane emissions.
- **Feeding technologies:** Beta-agonists and increased ionophores are additions to feed that improve lean tissue growth. Adding them to cattle's feed can increase weight gain in cattle without requiring additional feed intake.
- **Other innovative techniques:** Other techniques should also be examined and tested in collaboration with the farming community with the intent of increasing the feed-to-gain ratio, reduced days on feed, or decreased carbon intensity of beef production.

These methods can help to leverage the culture of innovation and flexibility on the Island. PEI could become a testing ground for new ways to sustainably and profitably raise cattle and improve the industry, reflecting how the Island's small size can result in its ability to be innovative and a leader.

EMISSIONS REDUCTIONS FROM DAIRY CATTLE

Dairy cattle, as with other livestock, produce emissions from enteric fermentation and manure. One option for reducing these emissions is to increase milk productivity per cow, which reduces the GHGs released per unit of milk produced.

Robotic milkers, in which cattle are fed high-quality feed and cleaned while being automatically milked, have been reported to increase milk production by as much as 20%.¹⁶ This technology is currently used in about 10% of operations on the Island.¹⁷

We recommend that support, either in the form of incentives or financing, be provided to increase the use of robotic milkers in Prince Edward Island. While they have a significant upfront cost, they can also save farmers money through reduced labour costs in addition to the higher yields that result.

The combination of these livestock management options would be a 0.6% below 1990 levels or 12,000 tonnes reduction in provincial emissions.

RECOMMENDED ACTIONS

- In consultation with the agriculture sector, develop and implement innovative strategies to reduce GHGs from fed cattle.
- Develop appropriate incentives and/or support to increase the use of robotic milkers on dairy farms.

MANURE MANAGEMENT

Reducing the manure produced by cattle is an action that would reduce agriculture-related GHGs. The way manure is managed is another approach. Manure management involves activities such as manure storage, spreading and other practices such as composting. Specific opportunities for reducing emissions from manure management include:

- Modifying the timing of manure spreading to reduce methane emissions from the storage unit;
- Switching from liquid manure storage systems, which typically have anaerobic conditions (in which oxygen is not present) and that generate methane to solid systems (more aerobic systems that are exposed to oxygen) that generate carbon dioxide, which is less potent than methane; and
- Capturing methane that is generated and flaring or using it for heat or power generation. Details on this anaerobic digestion option are provided in the following section.

¹⁶ Iowa State University, *Robotic Milking Systems*. <http://www.milkproduction.com/Library/Scientific-articles/Milk-milking/Automatic-milking--Common-practice-on-dairy-farms/>. May 12, 2011.

¹⁷Source: PEI Federation of Agriculture and PEI Dairy Association.

ANAEROBIC DIGESTION

Manure is broken down by bacteria under anaerobic conditions to produce biogas (a mixture of methane and carbon dioxide). Anaerobic digesters enable this biogas to be used for generating heat and electricity for buildings or greenhouses.

Prince Edward Island has done a good job of separating its waste, such that there is little potential at existing landfills to produce biogas. However, there is an opportunity to do so in a smaller way on farms or with groups of farms, replacing or supplementing oil heat with locally produced energy. An incentive structure should be developed that reduces the cost of digesters for agriculture sites that are able to process their own waste or take waste materials from other sites. This would also help to reduce GHGs from transportation resulting from shipping waste to the Central Compost Facility.

In addition to the education and training identified above, we recommend the development of specific programs to encourage implementation of aerobic and anaerobic digestion systems on farms or groups of farms.

An increase in the implementation of anaerobic digestion on farms could result in a 0.1% (1,200 tonnes) reduction in overall provincial emissions.

RECOMMENDED ACTION

- Develop and implement an incentive structure and/or programs to encourage implementation of aerobic and anaerobic digestion systems on farms or in groups of farms.

LONGER-TERM CONSIDERATIONS

Climate change mitigation would be an ongoing process over the coming years. This document itself examines the next 15 years, so we would be remiss if we only examined options that are tried-and-true tested today. Short-term actions are critical to reducing GHGs in the near term. However, there are also longer-term options that are important to continue reducing emissions beyond the immediate future. Even longer-term options should be examined and initiated now to ensure results in the future. This section includes some of these types of forward-looking actions.

GHG REDUCTION THROUGH BETTER CATTLE GENETICS

One example of longer-term actions includes genetic improvements to cattle herds. In other words, it includes breeding for or sourcing animals that have naturally better feed conversion efficiencies.

This option is not an easy, quick solution. It can, however, lower GHGs over the longer term, by 1.2% or 23,000 tonnes. We recommend beginning a research program in collaboration with postsecondary institutions to begin developing options for cattle breeding focused on feed conversion.

VACCINES

Vaccines to suppress methane formation caused by microbes (methanogenesis) can reduce emissions. While this is currently being done to a lesser extent through the application of specific agents or dietary additives, vaccines are being developed. They are not yet commercially available; however, they could have a significant impact on emissions reductions in future years.

We recommend that Government monitor advances in methanogenesis vaccines with the intent of applying them once they are tested, deemed to be safe, and commercially available in the later years of a Strategy. This could result in a 0.3% (5,800 tonnes) reduction in emissions.

SEAWEED AS FEEDSTOCK

A new option that warrants further exploration is to feed cattle seaweed, which may have potential benefits.¹⁸ There may be an additional 0.4% (8,800 tonnes) from the use of seaweed to reduce methane emissions from cattle.

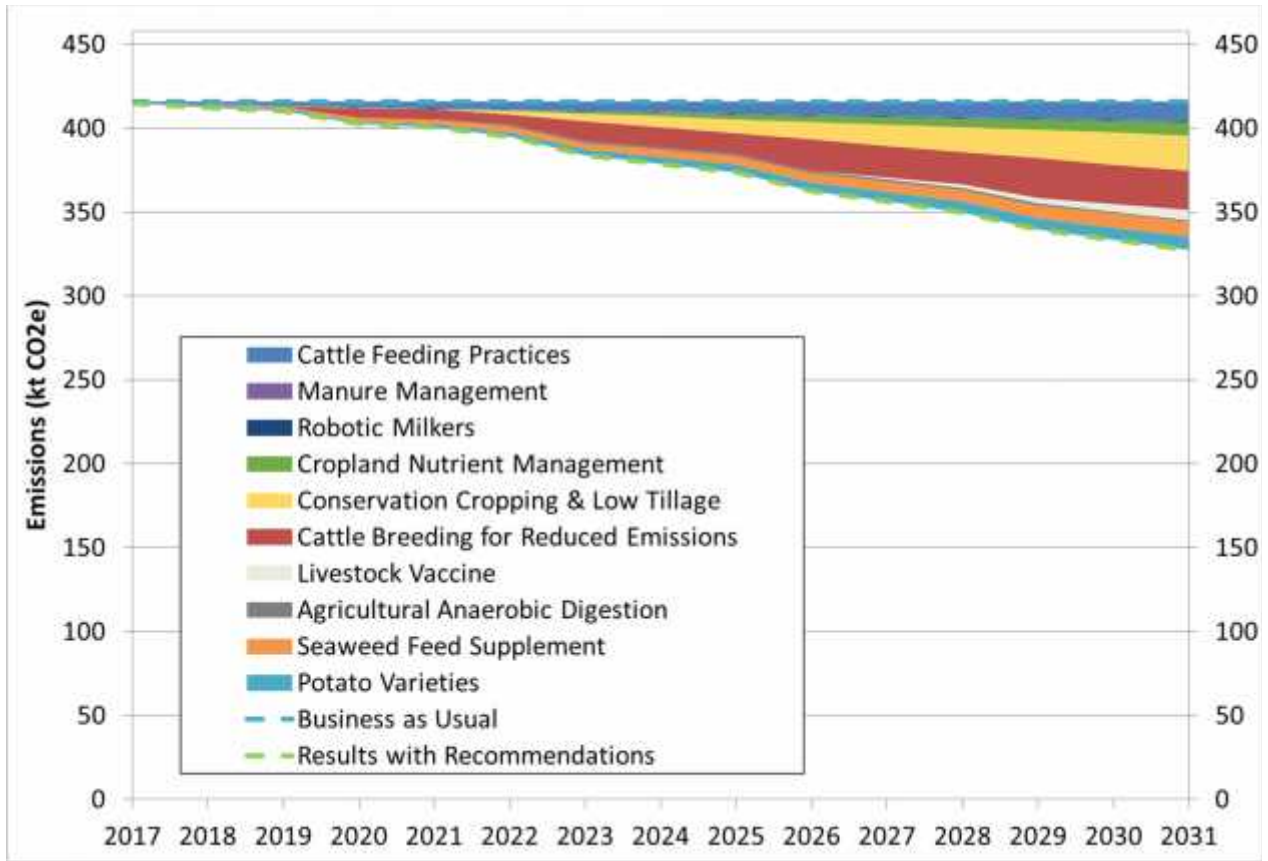
EMISSIONS REDUCTIONS

Agriculture is a key economic driver of PEI's economy. With livestock, however, success can lead to greater emissions. Time should be spent now to research and test new ways of farming that allow the Province to grow its economy while transitioning it to a low-carbon one.

The actions highlighted above are one step in this process. **Cropland, livestock, and manure management would reduce provincial emissions by over 50,000 tonnes, or almost 4%, by 2031. Adding in additional emerging opportunities may increase reductions to 89,000 tonnes, or 4.5%.**

¹⁸ <http://www.cbc.ca/news/canada/prince-edward-island/pei-cow-farting-1.3856202>;
<http://www.manitobacooperator.ca/news-opinion/news/seaweed-supplement-could-slash-cattle-methane/>

Figure 3. Food and Farming Emissions Reductions



FORESTRY POLICIES

In PEI, as elsewhere, deforestation and forest degradation contribute to GHG emissions as carbon sequestered (stored) in trees is emitted into the atmosphere. From 2000 to 2010, PEI lost approximately 1.3% (4,616 hectares) of its total forested area to agriculture.¹⁹ In addition to emissions being released into the atmosphere, if the lost land is not converted back to forest, the future sequestration potential of the land is highly diminished.

In this section, we focus on recommendations designed to maximize carbon sequestration of PEI’s forests.

¹⁹ Government of Prince Edward Island. *State of the Forest Report 2010*. December 2013.

FOREST MANAGEMENT

Forested land in PEI is predominately privately owned, with more than 86 percent of the area classified as forest owned by more than 16,000 private individuals or organizations.²⁰ With so many small woodlots, it is much more difficult to enact broad-based forestry policies.

FOREST ENHANCEMENT PROGRAM AWARENESS

To promote the health and prosperity of the forest at the provincial level, PEI has a Forest Enhancement Program (FEP) in place that provides advice, service, and funding for landowners who want to implement sustainable forest practices. Integral to the program is the creation of personalized Forest Management Plans. The plans focus on the economic and environmental potential of a woodlot's native tree and shrub species. They also identify ecologically sensitive areas and critical wildlife habitats, and they outline treatments and harvest options which are appropriate to the forest and the owners' goals.

From 2000 to 2010, an average of 2,257 hectares per year (or less than 1% of the total forested land in PEI) received treatment.²¹ While there are signs that forest owners are becoming more attuned to having a forest management plan,²² greater program participation is required to enhance practices that can increase carbon sequestration.

An education and outreach program should be developed to increase awareness, particularly amongst owners of small woodlots, who are less aware of the program.²³ While we expect that awareness could have increased in the past few years, it is not expected to be significantly greater.

The FEP should also be updated to include the carbon sequestration options presented below to maximize the carbon capture potential of the Island's forests.

CARBON SEQUESTRATION

Historically, it has been assumed that large, unharvested forests absorb more carbon than they release. However, this perspective is evolving. Recent research has shown that, over their lifetimes, trees hit a

²⁰ Ibid.

²¹ Ibid.

²² According to *Prince Edward Island Woodlot Owners: Current Trends Regarding their Forest Uses, Management, and Values*, the top three reasons for owning a woodlot ("For the sake of [the] future generation", "Preserve forest ecosystems", "Wildlife enjoyment") increased from 2002 to 2009. Over the same period, there was an 8% drop in the response "Doesn't have [plan] and is not interested" and a 16% change from those planning to work on a management plan to those who had.

²³ P. Edward and I. Woodlot, *Prince Edward Island Woodlot Owners: Current Trends Regarding their Forest Uses, Management, and Values*.

sequestration peak and then sequester less carbon towards the end of their lives. When they die, they emit much of their stored carbon through the decomposition process. Conversely, young trees grow quickly and therefore provide significant carbon sequestration benefits. They grow faster than their older counterparts, therefore sequestering more carbon in the short term.²⁴

Because of the varying sequestration potential during the lifespan of a tree, policies that incent leaving forests to grow, unmanaged, are not necessarily the most effective to maximize carbon sequestration. Instead, policies can be adopted that target the creation, maintenance, and growth of young forests.

To maximize the carbon capture potential of forests, forest carbon management techniques should be employed. They are a critical part of maintaining a forest's health and, if done well, ultimately ensure that a forest maximizes its carbon capture potential. Traditionally, forest management consists of site preparation, planting, maintenance, and pre-commercial thinning.

The following carbon management practices should be applied to increase sequestration:

- **Increase young, healthy forest stocks:** Increasing the number of young trees can be accomplished principally through increased planting within existing forest management programs. PEI forest management already focuses on this area,²⁵ so it is more a matter of continuing existing policies than developing new ones.
- **Plant native, nitrogen-fixing trees:** To promote the increased growth of the forest stock, nitrogen-fixing trees (such as the speckled or mountain alder) can be added to the stand mix. Nitrogen is a natural fertilizer and can help increase the growth rate of the young trees. While results are not conclusive, nitrogen has been shown to increase the amount of carbon sequestered by trees,²⁶ and nitrogen-fixing trees follow the same process, although may sequester less.
- **Increase the timber harvest, targeting less productive, less healthy, older tree stock:** By turning older trees into wood products, we can avoid or delay emissions that would have normally been generated through the natural decay process. By removing and processing these trees in a sustainable manner, the availability of land to grow younger trees would increase. The harvest can also be used for bioenergy, offsetting the use of traditional fossil fuels.
- **Increase the thinning of stands:** Thinning is the selective removal of the underperforming or less valuable trees in a stand. Thinning can lead to a higher annual growth for the remaining trees. It can also increase the quality of wood by “structuring” the remaining trees to increase the amount of light and air that interior branches can access, allowing them to increase their diameter. Both options can have significant effects on the carbon sequestration of a forest. The removed thinnings can also be used for bioenergy.

²⁴ J. L. Bowyer, S. Bratkovich, M. Frank, K. Fernholz, J. Howe, and S. Stai, *Managing Forests for Carbon Mitigation*.

²⁵ Government of Prince Edward Island. *State of the Forest Report 2010*. December 2013.

²⁶ L. A. Black, T. Andrew, J. Jassal, S. Rachhpal, Fredeen, “Carbon Sequestration in British Columbia’s Forests and Management Options,” *Forestry*, p. 20, 2008.

RECOMMENDED ACTIONS

- Increase the number of hectares included in the Forest Enhancement Program (FEP) to 3325 hectares per year.
- Update the FEP to include net carbon sequestration policies:
 - Concentrating the program on increasing healthy forest stocks through planting seedlings;
 - Introducing nitrogen-fixing trees in the planting mix;
 - Harvesting older, less healthy trees; and
 - Increasing thinning.

LANDSCAPE CONVERSION

CONVERTING ABANDONED AGRICULTURE TO FOREST

Over the last century, PEI has experienced a significant shift in land use from farm to forest. In 1900, 31% of PEI's land area was forested, a historic low for forest cover in the province. Over the next decades, PEI experienced successive waves of farm abandonment as the young moved to the mainland for other opportunities. During this period, the forests returned due to natural regrowth. As of 2010, 43.9% (250,084 hectares) of PEI's land was forested.²⁷

Abandoned agricultural land also continues to exist and accounts for 4% of provincial land use.²⁸ If returned to forests, this abandoned agricultural land can increase the net carbon sequestration potential of the province. Left alone and without human intervention, many of these areas would return to forests naturally. However, on land where the soil quality is sufficiently degraded due to modern farming techniques, the forest regeneration process may take longer or never be completed, leaving only shrubs and bushes.

In these situations, **we recommend that PEI actively manage abandoned agricultural lands**, enabling them to return to forested land. Active management speeds up the process and therefore increases the carbon sequestration process, primarily due to decreased seedling mortality in the early years of conversion. Abandoned agricultural land often borders active agricultural land.

We recognize that with the high percentage of private land on the Island, actively managing abandoned agricultural land is more difficult than simple regulation. However, developing policies (which could include incentives) that encourage owners to do so is an important consideration for reforestation. Since

²⁷ Government of Prince Edward Island. *State of the Forest Report 2010*. December 2013.

²⁸ Ibid.

active forest regeneration management can be expensive, **passive management can be a much less expensive method for those abandoned lands that are in good health most likely to revert to forests naturally**. Passive management can take various forms, but in general the intervention needs to ensure that the land is left alone from grazing or agriculture by placing fences. By managing the conversion of the abandoned land to forest, the new growth can provide ecological benefits to the neighboring agricultural land, either actively or passively. For example, the new forests can reduce erosion and improve stream and bank health.

More information is needed on the location of the abandoned agricultural land and the percentage that should naturally convert to forest under passive management rather than requiring active management. Once this is determined, it would be possible to geospatially target the abandoned land by management technique. It is important that PEI has up-to-date and salient data on the state of the forests and their carbon sequestration potential. To create a reporting system more amenable to carbon accounting, we recommend the following:

- Increase the reporting frequency of the *State of the Forest Report* to every five years;
- Include forest carbon sequestration baseline and data in the *State of the Forest Report*; and
- Increase geospatial data access and reporting.

These recommendations would increase awareness on the effects of land conversion and forest management on the carbon sequestration potential of PEI's landscape. They would also enable policy makers and forest professionals to better measure the carbon sequestration effects from policy interventions.

DECREASING FOREST TO AGRICULTURAL CONVERSION

From 2001 to 2010, forest to agriculture conversion was the greatest driver of deforestation in PEI. An area of 4,616 hectares was converted from forest to agriculture, primarily for the establishment or expansion of blueberry fields.²⁹ During the deforestation process, above and belowground biomass removal, losses in wood product conversions, and firewood burning all lead to greenhouse gas emissions unless contained by technologies such as EPA or CSA-certified wood stoves. In addition, as forest is removed, new forest growth will not occur, leading to additional future carbon emissions not being sequestered.

On a per-hectare basis, avoiding deforestation is the most effective forestry-related carbon sequestration policy. It is also one of the most difficult to implement. The conversion of forests to agricultural land is an economics-based decision, so economic policies would need to be developed that change landowners' decisions to convert. One option is to implement a policy mechanism known as REDD (Reducing Emissions from Deforestation and Degradation), which provides payments to forest

²⁹ Government of Prince Edward Island. *State of the Forest Report 2010*. December 2013.

stakeholders to incentivize them to keep the forests standing. Alternatively, property taxes could be reduced for forested land.

Currently, land-based property taxes are two times higher per acre for non-farm assessed managed woodland than for farm land.³⁰ The tax system also deems clearing, leveling and draining land as tax-deductible. A change in the tax system to create level incentives between owning forests and agriculture would be an easy and powerful first step in reducing deforestation in PEI.

There are two types of potential conversion-reduction options, depending on the type of land:

- **Actively managed:** These areas are preferably those that are most degraded and unlikely to revert to forest on their own. They can also include watershed land that has low overall levels of forest cover.
- **Passively managed:** These areas are those that are healthy, and without further human degradation, would return to forest on their own.

We have not quantified the potential reductions from avoiding deforestation, primarily because GHG forecasts do not account for deforestation, so we do not want to skew the values unintentionally. However, reducing deforestation could potentially have significant results.³¹

RECOMMENDED ACTIONS (2018-2027) – AGRICULTURAL CONVERSION

- Increase the frequency of publication of the *State of Forest Report* and include additional data.
- Identify and target approximately 1% of abandoned agricultural plots, for actively managed forest conversion.
- Identify and target 670 hectares, approximately 3% of abandoned agricultural plots for passively managed forest conversion, which would not have been converted otherwise.
- Identify and prevent the conversion of 460 hectares from forest to agriculture (10% of the land expected to be deforested over the next 10 years).

EMISSIONS REDUCTIONS

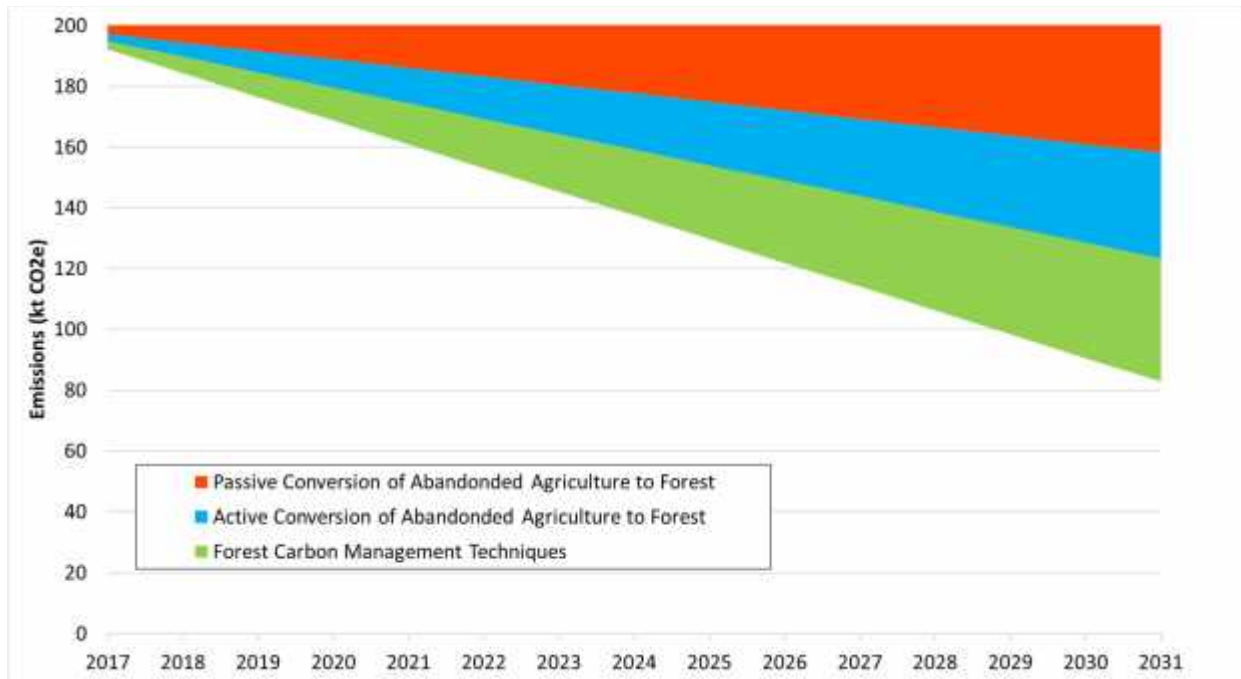
Successful implementation of the identified forestry management would reduce provincial emissions by 117,000 tonnes, or 6% (approximately 2% or 35,000 tonnes through active conversion management, 2% or 42,000 tonnes for passive conversion management, and 2% or 40,000 for forest carbon

³⁰ K. Macquarrie, "Forest Cover on PEI Opportunities and Challenges," PowerPoint Presentation.

³¹ While not included in our analysis, potential results could be in the range of 4-7% reductions with an aggressive program.

management techniques). The policies would also provide local benefits for PEI’s forest ecosystem including an increase in biodiversity, soil and water quality, the biomass stock, while maintaining a robust source of wood products for PEI’s economic needs. We note that these actions are not in opposition to the potential for increasing biomass-related heat sources. These initiatives, rather, allow for sustainable forestry management practices (e.g. thinning) and instead focus on reducing deforestation and increasing forestation.

Figure 4. Forestry Emissions Reductions



MOVING PEOPLE AND GOODS

New ways to transport people and move goods need to be implemented to achieve the emissions reductions target recommended for the Strategy. While other sectors are reducing their fossil fuel use and becoming more sustainable, transportation-related emissions continue to grow. For example, between 1990 and 2014, transportation-related emissions grew by over 12%, from 680,000 tonnes to 770,000 tonnes.³²

To meet the recommended reductions targets, the Island will need to place a particular emphasis on the transportation sector. Many of the initiatives included here are also included in the Provincial Energy

³² Environment Canada, 2016. Economic Sector Tables by Province and Territory. *National Inventory Report*. <https://www.ec.gc.ca/ges-ghg/default.asp?lang=En&n=83A34A7A-1>

Strategy, as this is a sector in which significant overlaps occur. Specifically, we recommend focusing on the following key items as part of a Climate Change Mitigation Strategy:

- **Accelerate adoption of electric vehicles:** Increasing the number of electric cars, taxis and commercial vehicles is a critical component of reducing transportation-related emissions. We recommend developing a combination of education programs combined with incentives to accelerate the adoption of electric vehicles on Island roads. The Federal Government is also providing \$62.5 million dollars over 2016/17 and 2017/18 to develop and demonstrate electric vehicle and alternative fuel infrastructure, which the Provincial Government Island could work to leverage.³³ A 3.2% (63,000 tonnes) reduction in provincial emissions could result from this option.
- **Replace diesel trucks with Compressed Natural Gas:** Electrification of commercial trucks is not currently possible. We therefore recommend examining the feasibility of, and policies for, converting larger fleets of diesel trucks with compressed natural gas use. This would focus on new purchases only, due to high costs of retrofits, but could lead to over 12 million litres of diesel gasoline displaced and a 0.6% (13,000 tonnes) decrease in emissions by 2031.
- **Convert the Island's garbage collection fleet to synthetic natural gas (biogas):** While PEI does not produce enough biogas to fuel a large number of vehicles, installing an anaerobic digestion facility at the Central Composting Facility and producing biogas from the associated waste could provide enough biogas to fuel the Island Waste Management Corporation (IWMC)'s waste truck fleet, leading to a 0.2% or 3,900 tonnes reduction in emissions.
- **Examine the feasibility of replacing school buses with electric buses:** Government is currently considering a test purchase of electric school buses, as school bus schedules are ideally timed to allow for recharging between morning and afternoon trips. Should the test purchase occur, and pending results of the initial test runs, we recommend supporting a transition to an all-electric fleet, which could reduce emissions by 0.9% or 18,000 tonnes.
- **Develop an active transportation strategy and committee supported by an annual budget:** Active transportation is an important component of transportation goals. Driving less reduces GHGs, but it can also increase the health and mobility of the population, which has multiple additional benefits. However, the cultural and infrastructure changes to increase activity levels is a complex and long-term process. For this reason, we recommend the creation of a committee to oversee development of an active transportation strategy, focus on cultural change related to how Islanders travel and transport goods, and examine infrastructure options to encourage active transportation and efficient use of vehicles. A conservative estimate for emissions reductions may be 0.1% or 1,300 tonnes.

While a move to non-emitting vehicles is important, the transition will take time. Before it is complete, there will still be gasoline-powered cars on the road that are contributing to emissions. To reduce related emissions from these vehicles, these other low cost complementary programs could be implemented:

³³ Natural Resources Canada. <http://www.nrcan.gc.ca/energy/science/programs-funding/18356>

- **Develop and implement an emissions testing program:** To reduce related emissions from gasoline-powered vehicles, we recommend developing and implementing an emissions testing program for all gasoline-powered vehicles to ensure they are not emitting more than they should. This may result in a 0.2% (3,600 tonnes) reduction in emissions.
- **Consider factoring the costs of driving and types of vehicles in registration fees:** Implementing a tiered registration fee system would assist with signalling to Islanders the importance of emissions reductions. While this action could be addressed through a carbon pricing model, it is worth examining separately to provide added attention and consideration in this highly important area.
- **Efficient driving campaign:** A behavioural campaign encouraging Islanders drivers to reduce acceleration rates and unnecessary braking may reduce emissions by 0.5% or 10,000 tonnes.
- **Routine auto-maintenance campaign:** This campaign would encourage more car owners to perform regular oil changes, check the oxygen sensor and maintain recommended tire pressure and may reduce emissions by 0.3% or 5,800 tonnes.
- **Carpooling and trip chaining campaign:** Encourage drivers to commute more frequently with one or more passengers (via online or smart phone application) and to combine errands to reduce fuel usage. A successful campaign may reduce emissions by 0.5% or 9,500 tonnes.

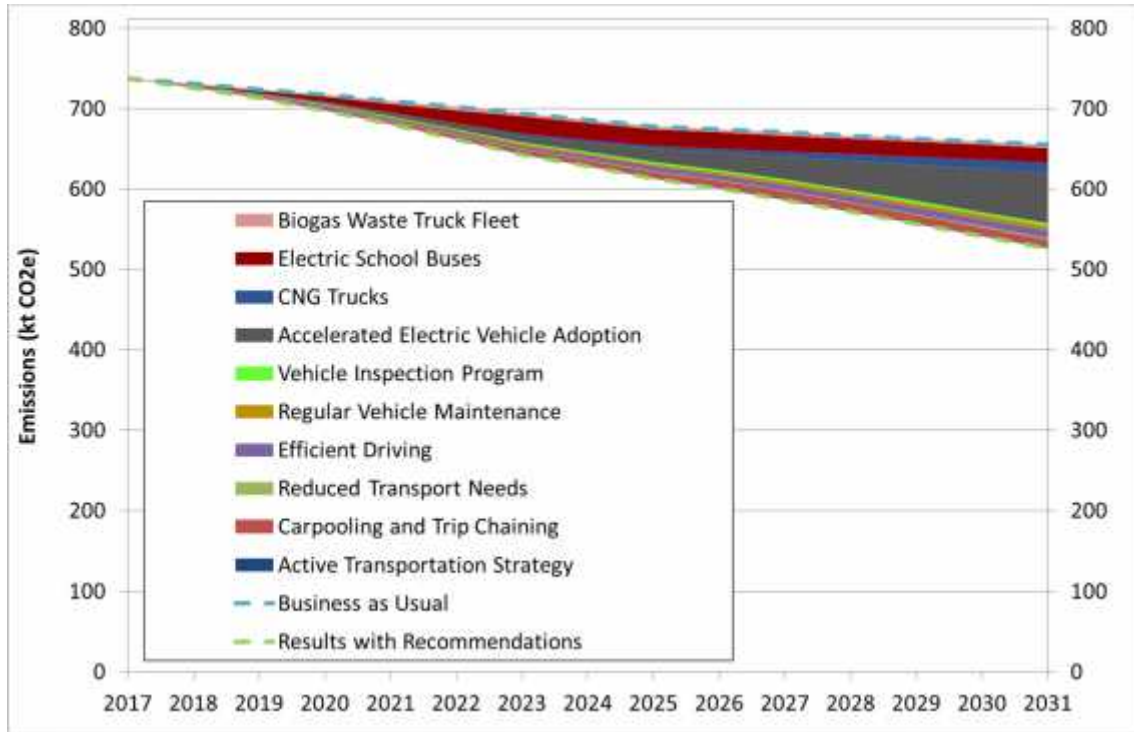
RECOMMENDED ACTIONS

- Develop an appropriate incentive, in combination with education, to encourage greater uptake of electric vehicles.
- Work with industry to conduct a feasibility study on CNG use for trucks in PEI.
- Assess the feasibility for producing biogas from organic waste and other sources, to produce a vehicle fuel to operate the PEI waste truck fleet.
- Based on pilot test results, consider the introduction of electric school buses.
- Create a provincial transportation committee that is supported by an annual budget and will focus on active transportation strategy development, cultural change, and infrastructure changes such as cycling lanes.
- Develop and introduce regular emissions testing for all vehicles fuelled by diesel and gasoline.
- Consider reflecting the cost of driving, as well as of different types of vehicles, in registration fees and/or fuel taxes.
- Consider launching an education campaign focused on efficient driving behaviours such as reducing acceleration rates and unnecessary braking.

EMISSIONS REDUCTIONS

The actions highlighted above would reduce provincial emissions by almost 100,000 tonnes, or over 5% from 1990 levels, by 2031. If we include behavioural-change programs, provincial emissions could be reduced by 6.6% (129,000 tonnes). Without these actions, transportation-related emissions may still continue to grow, which makes these actions an even more critical component of an overall Strategy.

Figure 5. Transportation Emissions Reductions



MAKING DECISIONS AND FURTHERING PROVINCIAL GOALS

The above sections outline concrete actions that can be taken to reduce emissions. But in our sessions with stakeholders and the submissions we have received from Islanders, we recognize that additional actions must be taken to achieve the desired results, even if their impacts cannot be initially quantified.

These additional actions include supporting municipalities in developing community energy plans that focus on sustainability and emissions reductions. This support should take into account rural communities and their unique challenges in reducing emissions. For example, we recommend that Government consider the development of an at-home composting option for rural residents to reduce transport emissions from Waste Watch. The option should be developed in partnership with rural municipalities and involve discussions and collaborative meetings to identify key needs and opportunities.

The Provincial Government is currently developing a land-use planning document, which is an important step forward and can be used to support a Climate Change Mitigation Strategy. Any provincial land-use plan should address all municipalities not covered under a municipal land-use plan, and support integrated planning for the municipalities to enable implementation of the Strategy. Aligned with this, it is important that Government review existing tax policies that encourage or reward low-density areas and sprawl (for example the uniform provincial property tax to which incorporated municipalities add taxes, making it less expensive for individuals to live further away from their places of work and higher-density areas).

A large portion of PEI's economic development strategy is currently focused on exports. While we recognize the importance of external markets, a transition to a low-carbon economy must also look for local market opportunities. A local food strategy should be developed to reduce the emissions from the transport of food as well as promote the growth of carbon-mitigating plant life on the Island. This can include rooftop and community gardens, natural lawns, and programs for increasing the sale of local products at farmers' markets and in grocery stores.

This document provides recommended actions that can be taken today and in the next few years to mitigate the negative impacts of climate change. But it cannot be accomplished without the support, interest, and commitment from Islanders and businesses, and this commitment does not occur automatically. Therefore, we see the development of an education and outreach campaign as a key inclusion of the final Strategy. One component should be school-based, but it would also promote broader awareness of climate change issues and ways to reduce GHG emissions.

ACTIONS FOR FURTHER CONSIDERATION

- Support municipalities in developing community plans that focus on sustainability and emissions reductions.
- Consider development of an on-site composting option for rural residents to reduce transport emissions from Waste Watch.
- Develop a provincial land-use plan that addresses all municipalities not currently covered under a municipal land-use plan.
- Support integrated planning for the municipalities to enable implementation of a Climate Change Mitigation strategy.
- Review existing tax policies to identify ways to encourage higher density and reduce sprawl.
- Develop an education and outreach campaign focused on behaviour change.
- Develop a local food strategy.

LEADING THE WAY

This report outlines action items that would reduce PEI's GHG emissions, in combination with existing reductions, by over 760,000 tonnes, or 39% below 1990 levels,³⁴ which meets the NEGECP target.

We have worked to include conservative estimates in our calculations to avoid placing PEI in a position of developing an unattainable target. We have also not quantified all the recommended actions. This is not because they will not reduce emissions, but because we cannot be confident in the numbers we would produce or provide reasonable estimates. This is an important consideration, because Prince Edward Island's emissions are influenced by economic and other broad factors that could increase the forecasted emissions, so additional opportunities, even if not quantified today, are important to identify.

We therefore believe that Government can adopt the NEGECP target in its Climate Change Mitigation Strategy should it desire to do so. While such an ambitious target would be difficult to achieve, we believe it is achievable, particularly given the changing context of climate-change concerns in Canada today.

³⁴ This reduction includes 10% reduction already forecasted to be achieved in the absence of a new strategy.

APPENDIX A: SUMMARY OF FEEDBACK

The following table summarizes public feedback received through the PEI Climate Change Mitigation Strategy website and public consultations. Inclusions in bold indicate more than one individual/organization provided the same feedback.

	What's good	What can be improved	What's missing	Other
General	<ul style="list-style-type: none"> Majority of sentiments and recommendations are a positive move in the right direction. 	<ul style="list-style-type: none"> Provide a more granular breakout of the emissions reductions. Low income earners should not be the only ones compensated in a revenue-neutral model. There needs to be a greater focus on renewables. The draft does not fully encompass the actions of climate change mitigation as defined by the UN (specifically carbon sinks and silviculture and green agriculture) 	<ul style="list-style-type: none"> Recognize that PEI's strategy is part of a global picture – take a more global viewpoint (i.e. recognize the difference between short-haul and long-haul trucking in terms of local food sources). Emphasize locally produced and marketed food and goods (develop a local food strategy). Include electricity. Don't just focus on reducing GHGs, since PEI's role is small. Focus on other benefits (e.g. healthier environment, money stays local, local control of energy production, empowerment to find solutions, local capacity, etc.). 	<ul style="list-style-type: none"> Carbon Pricing: Concern about carbon levy not applying to large emitters and providing false sense that emissions reductions are occurring when large emitters still producing. Will this mechanism reinforce sustainable behaviours like introducing renewable energies? Carbon Pricing: Revenues should be put into renewable resource subsidies, specifically in schools to teach the next generation its importance (link education and things like solar panels) Carbon Pricing: Subsidize families, organizations, individuals that pay into carbon tax with the revenue to apply renewable solutions, and educate them about the opportunities. Water turbines in rivers and dams.

	What's good	What can be improved	What's missing	Other
General (continued)			<ul style="list-style-type: none"> Surprised there is no mention of expanded wind power. There is no mention of tree planting or forestry. 	<ul style="list-style-type: none"> How many Islanders did we ask about carbon pricing; how many responded? How do you make it revenue neutral? Who has Dunsky been consulting? Implement a "fee and dividend" system as supported by the Green Party of PEI. Carbon pricing must be revenue neutral. Where does the funding come from to pay for all these ideas?
Buildings and Facilities	<ul style="list-style-type: none"> Building code Heat pumps and storage 	<ul style="list-style-type: none"> Change "wood heating" systems for provincial buildings to "biomass" systems (i.e., grain, 2nd-grade corn). Clarify fuel switching Wood chips may not have significant impact on GHGs. 	<ul style="list-style-type: none"> Cite data sources for targets and existing activities Concern about emphasis on heat pumps and increasing electrification (keep to a 2050 goal). 	<ul style="list-style-type: none"> Wind turbines and thermal storage – look at Summerside. When updating the building code, add specific heating requirements for heat pumps. Hopefully the new energy efficiency utility will not just be window dressing. Until electricity isn't on a profit model electric heat isn't the best option. How is cutting down a good tree carbon neutral (and insurance and efficiency matters).

	What's good	What can be improved	What's missing	Other
Food and Farming	<ul style="list-style-type: none"> Working with farmers and associations. Conservation cropping. Biogas from animal waste and garbage. 	<ul style="list-style-type: none"> Remove recommendation for vaccines (concern about what the vaccines will do to the milk). For breeding cattle, create a miniature cow breeding test program and create test farms to explore breeding cattle for fewer GHG emissions. (www.modernfarmer.com). Disagreement with increasing robotic milkers. More work needs to be done to convince farmers to leave plowing until the spring (paying them to offset any issues might be a way to do this). Disagree that fisheries and aquaculture can't contribute – solar-powered boats could go a long way in reducing carbon. Government should find a way to lower the price of food produced, i.e., organically or sustainably (less fertilizer). 	<ul style="list-style-type: none"> Look at R&D being done in Australia, where researchers have utilized red seaweed supplement for cattle which has reduced methane gas by as much as 99%. Research effectiveness of crops such as hemp and GM grasses that can absorb CO2 and can also be used for textile industry. Does not fully address all elements of mitigation – in particular, protection of natural carbon sinks or creation of new sinks through silviculture and green agriculture. (see detail below). Local food market – PEI should start helping local farmers produce food that is coming into the province. Carbon sequestration (could be a market for PEI) Soil tests to measure organic matter should be mandatory. 	<ul style="list-style-type: none"> Being a farmer, I would much rather see this program on a 5-year project working with the industry rather than being forced to deal with this. Not sure I understand excluded amounts produced by agriculture (probably in discussion of carbon pricing?) Maybe tax bad behaviours and provide incentives for good behaviours? How does the building of a very large structure outside Kensington to hold nitrogen reflects on reduction? Growing crops specifically for biogas is not a good solution (needs to be clarified) It was not that long ago that PEI was noted for its tobacco production – and now we see no tobacco produced – the right crops produced – the right way – could make PEI an example for positive change. Is the organic sector the leader in reducing agriculture emissions?

	What's good	What can be improved	What's missing	Other
<p>Food and Farming</p>		<ul style="list-style-type: none"> • Could explore organic production for livestock (become a testing ground). • For manure management, spreading manure when the ground is frozen are also issues to talk about. • “diet that inhibit uptake of electrons and hydrogen.....” Please check this language with knowledgeable animal scientist. As a chemist I have problems understanding this. • On page 16, natural gas and bio-gas is mentioned. Capturing bio-gas from existing animal waste and garbage is an excellent idea. However, we should be aware that growing crops specifically for bio-gas is not a good solution. And natural gas, by some estimates, is a worse fuel than coal for climate change, because of fracking blow-outs and other leaks. • Confusion about cattle diet wording. 	<ul style="list-style-type: none"> • Ensure small farms are viable – should be a priority. • Education campaign to persuade consumers to shift away from the consumption of beef and dairy products, in favor of a higher intake of vegetables? 	

	What's good	What can be improved	What's missing	Other
Moving People and Goods	<ul style="list-style-type: none"> • Tax and rebate incentives for electric vehicles • Accelerate adoption of EVs. • Emissions testing would be easy (done in the past). 	<ul style="list-style-type: none"> • Change the CNG truck recommendation to electric sanitation trucks. • Use CNG for farming tractors. • Electrify transportation and add electric chargers to homes. • Where would the CNG be coming from? Is it renewable? • Not sure I agree with reviewing tax policies – moving everyone out of rural PEI not a step in the right direction and charging them more taxes for no real change in services is not a model I support. • Conflict between biogas for waste truck fleet and local composting. 	<ul style="list-style-type: none"> • Implement other type of energy source that can be used in the ferry system other than diesel. • Look into alternative road-way solutions to reduce emissions from creating/expanding road systems (i.e., recycled plastics to reduce oil input, solar roadways, decrease paved road system). Use local materials instead of important road materials from off-Island. • Tax and rebate incentives for hybrid vehicles. • Think it should be pointed out the short sighted decisions of the past – such as eliminating the trains on PEI and building a two lane bridge virtually guaranteeing movement of goods by truck therefore burning fossil fuels. • Bike lanes a priority, also small cars (electric) and solar canal boats. • Have all Cabinet and Deputies use electric cars. • Consider the adoption of infrastructure for hydrogen fueled vehicles. • Consider vehicle efficiency (e.g., speed limits). 	<ul style="list-style-type: none"> • What amount of transportation emissions is agriculture based? • Adding renewables are required to electrify transportation. • Review aerospace industry and its emissions, which may not be accurate (\$400M in sales, have all emissions been captured?) • An issue is urban vs. rural • Big adjustments are required – instead of building a new highway bypassing Cornwall, make travel by car to work less attractive (i.e., fast-speed train, bicycle lanes, restricted Government parking, moving closer to work, etc.)

	What's good	What can be improved	What's missing	Other
<p>Making Decisions and Furthering Provincial Goals</p>	<ul style="list-style-type: none"> • Agree with all the suggestions. 	<ul style="list-style-type: none"> • Change fuel switching to “wood”, change “wood” to biomass. • The wording about reviewing existing tax policies will pit rural vs. urban. • Additional suggestions: <ul style="list-style-type: none"> ○ Mandate that all light switches in public buildings be motion operated. ○ Mandate that all new buildings must have more than a certain percentage of their windows south facing. ○ Implement local drop-in office centres, in rural locations, so that many federal and provincial employees can work near home for one or more days per week. ○ Issue free Green Cones to all residences. • Adjust the tax laws so that landowners do not get a property tax reduction when they clearcut a forest. 	<ul style="list-style-type: none"> • Invest in Clean Tech R&D infrastructure for PEI’s economy allowing for sustainability. • Create an information resource (and implement stronger data collection) so communities can get the info they need to develop energy plans and reduce emissions. • Provide ongoing monitoring of emissions and reductions results. • Start with leadership – do all the MPs and Senators need to be in Ottawa – what about virtual voting. So start a carbon counting system on MPs, MLAs and Senators. • Allow government employees to choose conservation and clean energy solutions in their decisions. • Allow ongoing public input into climate change policy and implementation 	<ul style="list-style-type: none"> • A provincial utility that can institute a kW credit system for local (municipal) renewable energy by helping ratepayers. • Tax incentives for reducing GHG emissions. • Government needs to change the Electric Utility Act so Maritime Electric doesn’t have a guaranteed return on investment. • Government needs to address how capital investment in public buildings is managed (i.e., upfront high capital costs to improve energy efficiency are not favoured over other types of decisions). • PEI should work with the Eastern US States and Canadian Provinces to develop a renewable energy plan.

APPENDIX B: ESTIMATED GHG REDUCTIONS

The following table provides a snapshot of estimated emissions at provincial and sector levels for the years 2021, 2026, and 2031, as well as estimated percentage reductions over 1990 levels (the NEGECP and recommended Prince Edward Island target) and over 2005 levels (the Federal Government's target). Values may not sum due to rounding.

Table 1. Provincial and Sector-Level Emissions and Reductions

Sector	Emissions Summary	2021	2026	2031		
		Emissions CO2e)	Emissions (Tonnes CO2e)	Emissions (Tonnes CO2e)	Reductions over 1990 Levels (%)	Reductions over 2005 Levels (%)
Overall Provincial	Business as Usual	1,786,000	1,770,000	1,770,000	9.7% ³⁵	14.7% ³⁵
	With Projects	1,614,000	1,377,000	1,194,000	39.1%	42.4%
Buildings and Facilities	Business as Usual	350,000	350,000	350,000	12.3%	11.6%
	With Projects	262,000	163,000	110,000		
Agriculture	Business as Usual	416,000	416,000	416,000	4.5%	4.3%
	With Projects	400,000	362,000	327,000		
Transportation	Business as Usual	710,000	674,000	655,000	6.6%	6.2%
	With Projects	680,000	600,000	526,000		
Forestry ³⁶	Business as Usual	N/A	N/A	N/A	6.0%	5.7%
	With Projects	N/A	N/A	N/A		

³⁵ This reduction is forecasted as occurring in the absence of new actions.

³⁶ Forestry-related emissions are not included separately in Canada's GHG Inventory, so percentage reductions are from overall provincial emissions, not from a business-as-usual case.

The following tables provide estimated emissions reductions for each sector for the years 2021, 2026, and 2031, as well as the percentage change over 1990 levels both within each sector and within overall provincial emissions.

BUILDINGS AND FACILITIES

Table 2. Emissions Reductions from Building and Facilities

Recommended Action	2021	2026	2031		
	Emissions Reductions (Tonnes CO2e)	Emissions Reductions (Tonnes CO2e)	Emissions Reductions (Tonnes CO2e)	Contribution to Sector-Level Reductions from 1990 Levels (%)	Contribution to Overall Reductions from 1990 Levels (%)
Energy Efficiency Programs	40,000	89,000	138,000	25.2%	7.0%
Heating 10% of residential buildings with wood pellets	22,000	44,000	44,000	8.0%	2.2%
Quadruple government buildings heated with wood chips	19,000	38,000	38,000	6.9%	1.9%
Heating 10% of commercial buildings with wood pellets	5,500	11,000	11,000	2.0%	0.6%
Building Code - Residential	1,000	3,700	6,300	1.1%	0.3%
Mandatory Home Energy Rating and Disclosure	590	1,580	2,600	0.5%	0.1%
Stretch Building Code - Residential	80	300	500	0.1%	0.0%
Total	88,000	187,000	240,000	80.0%³⁷	12.3%

³⁷ Includes 36.2% forecasted reductions occurring in the absence of new actions.

AGRICULTURE

Table 3. Emissions Reductions from Agriculture

Recommended Action	2021	2026	2031		
	Emissions Reductions (Tonnes CO2e)	Emissions Reductions (Tonnes CO2e)	Emissions Reductions (Tonnes CO2e)	Contribution to Sector-Level Reductions from 1990 Levels (%)	Contribution to Overall Reductions from 1990 Levels (%)
Better Cattle Genetics	5,900	19,000	23,000	5.3%	1.2%
Conservation Cropping & Low Tillage	-	11,000	21,000	4.8%	1.1%
Fed Cattle	4,200	8,000	12,000	2.7%	0.6%
Seaweed Feed Supplement	2,500	5,700	8,800	2.0%	0.4%
Potato Genetics	2,300	5,200	8,100	1.8%	0.4%
Cropland Nutrient Management	300	3,700	7,700	1.7%	0.4%
Antimethanogen Vaccine for Livestock	-	-	5,900	1.3%	0.3%
Agricultural Anaerobic Digestion	-	1,200	1,200	0.3%	0.1%
Dairy Cattle - Enteric	300	500	700	0.2%	0.0%
Dairy Cattle - Manure	60	100	200	0.0%	0.0%
Total	16,000	54,000	89,000	25.9%³⁸	4.5%

³⁸ Includes 5.7% forecasted reductions occurring in the absence of new actions.

TRANSPORTATION

Table 4. Emissions Reductions from Transportation

Recommended Action	2021	2026	2031		
	Emissions Reductions (Tonnes CO2e)	Emissions Reductions (Tonnes CO2e)	Emissions Reductions (Tonnes CO2e)	Contribution to Sector-Level Reductions from 1990 Levels (%)	Contribution to Overall Reductions from 1990 Levels (%)
Accelerated Adoption of Electric Personal Vehicles	3,800	22,000	63,000	14.3%	3.2%
Replace School Buses with Electric Buses	11,000	20,000	18,000	4.1%	0.9%
Replace Diesel Trucks with Compressed Natural Gas	810	4,900	13,000	2.8%	0.6%
Efficient Driving	2,900	6,400	10,000	2.3%	0.5%
Carpooling and Trip Chaining	3,800	8,500	9,500	2.1%	0.5%
Regular Auto-Maintenance	1,600	3,700	5,800	1.3%	0.3%
Replace Garbage Truck Fleet Fuel with Biogas	3,900	3,900	3,900	0.9%	0.2%
Vehicle Inspection Program	1,000	2,300	3,600	0.8%	0.2%
Tax Policies to Increase Density	420	950	1,500	0.3%	0.1%
Active Transportation Strategy	410	1,200	1,300	0.3%	0.1%
Total	29,000	74,000	129,000	22.4% ³⁹	6.6%

³⁹ Includes 3.3% forecasted reductions occurring in the absence of new actions.

FORESTRY

Because the National Inventory Report does not break out forestry-related emissions, it is not possible to assess sector-level reductions. For this reason, **this table provides reductions over 1990 overall provincial emissions only.**

Table 5. Emissions Reductions from Forestry

Recommended Action	2021	2026	2031	
	Emissions Reductions (Tonnes CO2e)	Emissions Reductions (Tonnes CO2e)	Emissions Reductions (Tonnes CO2e)	Contribution to Overall Reductions from 1990 Levels (%)
Forest Carbon Management Techniques	14,000	27,000	41,000	2.1%
Active Conversion of Abandoned Agriculture to Forest	12,000	23,000	35,000	1.8%
Passive Conversion of Abandoned Agriculture to Forest	14,000	28,000	42,000	2.1%
Total	39,000	78,000	117,000	6.0%

