



HOUSE OF COMMONS  
CHAMBRE DES COMMUNES  
CANADA

# **CLEAN GROWTH AND CLIMATE CHANGE IN CANADA: FORESTRY, AGRICULTURE AND WASTE**

**Report of the Standing Committee on Environment and  
Sustainable Development**

**John Aldag, Chair**

**APRIL 2019  
42<sup>nd</sup> PARLIAMENT, 1<sup>st</sup> SESSION**

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### **Reports from committee presented to the House of Commons**

Presenting a report to the House is the way a committee makes public its findings and recommendations on a particular topic. Substantive reports on a subject-matter study usually contain a synopsis of the testimony heard, the recommendations made by the committee, as well as the reasons for those recommendations.

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# **THE STANDING COMMITTEE ON ENVIRONMENT AND SUSTAINABLE DEVELOPMENT**

has the honour to present its

## **EIGHTEENTH REPORT**

Pursuant to its mandate under Standing Order 108(2), the Committee has studied Clean Growth and Climate Change in Canada: Forestry, Agriculture and Waste and has agreed to report the following:





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## SUMMARY

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The House of Commons Standing Committee on Environment and Sustainable Development (the Committee) studied Clean Growth and Climate Change in Canada: Forestry, Agriculture and Waste over six meetings beginning on 22 November 2018.

The Committee recommends further federal support to accelerate greenhouse gas (GHG) emissions reductions from Canada's forestry, agriculture, and waste sectors. The potential for these sectors to further reduce emissions and to increase carbon storage holds promise for addressing climate change, and the Committee commends these sectors for their initiatives to reduce emissions. The Committee recommends that the federal government cooperate with provinces, territories, and interested governments to build on these successes, and to support the forestry, agriculture, and waste sectors in helping Canada address climate change.

The report notes that the forestry sector should be supported to increase long-term carbon storage in wood and to make better use of forestry residues. It notes that agriculture should be supported to further adopt best management practices that increase carbon storage within soils and technologies that reduce on-farm GHG emissions. Organics diversion, landfill gas capture, and greater waste reuse and recycling should be supported within the waste sector.

The Committee agrees with the many witnesses who recommended that the Government of Canada continue to fund research in order to unlock the full potential of the forestry, agriculture, and waste sectors to decrease GHGs. The report concludes that bioproducts provide an exciting opportunity to realize Canada's potential to make more efficient use of forestry and agriculture residues and to reduce emissions. By supporting the bioproduct and biofuel sectors, Canadian enterprises and technologies can be further developed while Canada reduces its GHG emissions.



# LIST OF RECOMMENDATIONS

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*As a result of their deliberations committees may make recommendations which they include in their reports for the consideration of the House of Commons or the Government. Recommendations related to this study are listed below.*

## **Recommendation 1**

**The Committee recommends that Natural Resources Canada explore incentives to promote the use of bioproducts and biomaterials, as are in place for bioenergy..... 29**

## **Recommendation 2**

**The Committee recommends that Public Services and Procurement Canada work with all government departments and agencies to identify fuel switching and other opportunities to decrease the greenhouse gas emissions from federal buildings and vehicle fleets..... 30**

## **Recommendation 3**

**The Committee recommends that Natural Resources Canada work with provinces, territories, interested governments, and industry to develop and implement a regeneration strategy or program for forests affected by natural disturbances, as is already required for harvested areas. .... 33**

## **Recommendation 4**

**The Committee recommends that Natural Resources Canada work with provinces, territories, interested governments, and industry to increase funding as required for the ecologically-appropriate suppression of forest fires..... 34**

## **Recommendation 5**

**The Committee recommends that Natural Resources Canada work with provinces, territories, interested governments and research partners to further research ecological landscape design to appropriately manage forest fires. .... 34**

**Recommendation 6**

The Committee recommends that Agriculture and Agri-Food Canada work with provinces, territories, and interested governments to encourage the development of soil nitrous oxide reduction protocols across Canada, building on the carbon offset market model implemented in Alberta..... 38

**Recommendation 7**

The Committee recommends that Agriculture and Agri-Food Canada further support research and development of new agricultural technologies, such as precision-guided nutrient application devices and techniques, including by updating the conservation cropping protocol to cover all soil zones across Canada..... 39

**Recommendation 8**

The Committee recommends that Agriculture and Agri-Food Canada ensure Canadian farmers are well informed about existing programs that could help them transition to low-carbon farming activities. .... 40

**Recommendation 9**

The Committee recommends that Environment and Climate Change Canada, Natural Resources Canada, and Agriculture and Agri-Food Canada work together and with partners, including the Canadian Wetlands Roundtable, to support research and conservation in order to maximize the carbon storage potential of wetlands. .... 41

**Recommendation 10**

The Committee recommends that Agriculture and Agri-Food Canada continue funding research and development on how improvements to animal diets, farming practices, and genomics could reduce methane emissions from livestock..... 42

**Recommendation 11**

The Committee recommends that the Government of Canada continue to work with provincial, territorial and interested governments to ensure reliable broadband Internet access in rural and remote areas. .... 44

**Recommendation 12**

The Committee recommends that the Government of Canada find further incentives and instruments to support access to innovative agricultural technologies by Canadian farmers. .... 45

**Recommendation 13**

The Committee recommends that the Government of Canada develop a bioenergy strategy to 1) identify the production needs at the farm level; 2) fund the research and development needed to grow the appropriate crops; 3) assess the investment and market potentials of the different products that could be produced and; 4) increase the renewable content in fuels. .... 47

**Recommendation 14**

The Committee recommends that the Government of Canada continue to work to eliminate the use of single-use disposable products in its procurement and operations..... 52

**Recommendation 15**

The Committee recommends that Environment and Climate Change Canada work with provinces, territories, interested governments, and other partners to identify opportunities for federal support of waste management research, such as the development of a harmonized national waste reduction and reuse strategy..... 53

**Recommendation 16**

The Committee recommends that Environment and Climate Change Canada collaborate with provinces, territories, interested governments, industry, and other stakeholders to develop an aspirational harmonized national model recycling system that could be adopted and/or adapted by jurisdictions responsible for waste management..... 54





# LIST OF OBSERVATIONS

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## Observation 1

The Committee encourages Canadian landowners to consider enhancing Canada’s carbon sink when managing their lands. .... 28

## Observation 2

The Committee encourages provinces, territories, and interested governments to facilitate the use of more forest residues for bioenergy. .... 31

## Observation 3

The Committee encourages provinces, territories, interested governments and power companies to consider converting coal-fired power plants to burn wood pellets. .... 31

## Observation 4

The Committee encourages the Wood Pellet Association of Canada to continue working with the Canadian Standards Association, and within the provisions of the Canada-European Union Comprehensive Economic and Trade Agreement, towards addressing the issue of boiler pressure standards compatibility. .... 31

## Observation 5

The Committee encourages provinces, territories, and interested governments to increasingly require the use of landfill gas capture systems and the diversion of organics from landfills. .... 51

## Observation 6

The Committee encourages consumers, industry, provinces, territories, and interested governments to reduce their use of single-use disposable products. .... 52





# CLEAN GROWTH AND CLIMATE CHANGE IN CANADA: FORESTRY, AGRICULTURE AND WASTE

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## INTRODUCTION

On 1 February 2018, the Standing Committee on Environment and Sustainable Development (the Committee) agreed to conduct a review of Clean Growth and Climate Change in Canada and decided that, in order to accomplish this review, it would study several focused areas and report to the House of Commons separately on each of them.<sup>1</sup> The Committee studied how the federal government can help accelerate greenhouse gas (GHG) emissions reductions from sectors addressed in selected sections of the *Pan-Canadian Framework on Clean Growth and Climate Change*. The Committee first studied Clean Growth and Climate Change in Canada: Built Environment and its subsequent report, *Better Buildings for a Low-Carbon Future*, was tabled in the House of Commons on 18 June 2018. The Committee then proceeded to a study of Clean Growth and Climate Change in Canada: International Leadership.

This third study in the Committee's review, Clean Growth and Climate Change in Canada: Forestry, Agriculture and Waste began on 22 November 2018. The study was carried out over six meetings, during which Committee members heard from 29 witnesses and received six written briefs.

The members of the Committee would like to thank each of the witnesses for contributing to the Committee's work.

## BACKGROUND

The Committee's current study focussed on what the Government of Canada could do to further support GHG emissions reduction initiatives in the areas of forestry, agriculture and waste.<sup>2</sup> These three sectors account for about 13% of Canada's GHG emissions, but

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1 House of Commons, Standing Committee on Environment and Sustainable Development [ENVI], *Minutes of Proceedings*, 1 February 2018.

2 Environment and Climate Change Canada, "Section 3.5: Forestry, Agriculture and Waste", *Pan-Canadian Framework on Clean Growth and Climate Change: Canada's Plan to Address Climate Change and Grow the Economy*, Gatineau, Environment and Climate Change Canada, 2016.



the agriculture and forestry sectors also absorb carbon from the atmosphere and store it in soils, wetlands and trees.

The forestry, agriculture and waste sectors are in large part under the purview of provincial governments. As noted by Beth McNeil, Assistant Deputy Minister for the Canadian Forest Service at Natural Resources Canada, even though federal programs that fund innovative research or provide national coordination of management efforts are important for those sectors, the “provinces and territories control the majority of the land base and resources.”<sup>3</sup> Provincial/territorial jurisdiction includes the development, conservation, management and production of forestry resources<sup>4</sup> whereas the federal government’s Canadian Forest Service “provides science and policy expertise and advice on national forest sector issues.”<sup>5</sup>

Agriculture is under shared jurisdiction.<sup>6</sup> Both the federal and provincial/territorial governments can legislate various aspects of the production, processing, merchandising, marketing and inspection of food and agricultural products. The federal government is also responsible for interprovincial and international trade of food and agricultural products. The federal-provincial/territorial agricultural partnerships illustrate the multi-level collaboration that takes place in this field. The [Canadian Agricultural Partnership](#) (CAP) is a five-year (2018–2023), \$3-billion cost-shared investment to support sustainable growth in the agriculture, agri-food, and agri-based products sectors. As Matt Parry, Director General at Agriculture and Agri-Food Canada explained, CAP “aligns federal, provincial and territorial policy and program priorities while providing provincial and territorial governments with the flexibility to address regional priorities and issues.”<sup>7</sup>

Waste management<sup>8</sup> also falls under shared jurisdiction. In most areas of Canada, municipal governments manage waste; the provincial and territorial governments establish waste management, reduction and recycling policies and programs; and the

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3 ENVI, [Evidence](#), 22 November 2018, 1535 (Beth MacNeil, Assistant Deputy Minister, Canadian Forest Service, Department of Natural Resources).

4 Section 92A of [The Constitution Act, 1867](#).

5 Natural Resources Canada, [About the Canadian Forest Service](#).

6 Section 95 of [The Constitution Act, 1867](#).

7 ENVI, [Evidence](#), 22 November 2018, 1545 (Matt Parry, Director General, Development and Analysis Directorate, Department of Agriculture and Agri-Food).

8 Waste “refers to any material, non-hazardous or hazardous, that has no further use, and which is managed at recycling, processing, or disposal sites”. Environment and Climate Change Canada, [Municipal solid waste: a shared responsibility](#).

federal government controls interprovincial and international movements of hazardous waste.<sup>9</sup>

The forestry, agriculture and waste sectors can all generate bioenergy,<sup>10</sup> and the Committee heard how the forestry and agriculture sectors can also generate bioproducts.<sup>11</sup> Generating more bioenergy and bioproducts could give value to products normally considered as “waste” in these sectors and could reduce GHG emissions by displacing some non-renewable fossil fuel use. As Don McCabe, director of Biological Carbon Canada, emphasized, a product currently considered as waste is often merely an “underutilized, underpriced opportunity.”<sup>12</sup> Innovation is needed for each of the sectors of forestry, agriculture and waste management to reach their respective full potentials.

### ***The Pan-Canadian Framework on Clean Growth and Climate Change***

The *Pan-Canadian Framework on Clean Growth and Climate Change* (the Pan-Canadian Framework, or PCF) is a shared commitment by the federal, provincial, and territorial governments to address climate change by reducing GHG emissions and adapting to the impacts of changing weather conditions. Released in December 2016, the Pan-Canadian Framework contains Canada’s plans to meet its GHG emissions reduction commitments made under the 2015 *Paris Agreement*. The Pan-Canadian Framework is the result of nearly year-long federal–provincial–territorial collaboration<sup>13</sup> and forms an agreement by these governments.<sup>14</sup> It is built on four pillars: 1) carbon pricing; 2) complementary

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9 Environment and Climate Change Canada, *Municipal solid waste: a shared responsibility*.

10 Bioenergy refers to any usable energy obtained from living organisms or their bioproducts, and may come in solid, liquid, or gaseous form. Natural Resources Canada, *Bioenergy Systems*.

11 Bioproducts refer to the “renewable products other than food and feed that are derived from agricultural, aquatic or forestry resources, or municipal wastes.” Agriculture and Agri-Food Canada, *Bioproducts*.

12 ENVI, *Evidence*, 29 November 2018, 1540 (Don McCabe, Director, Biological Carbon Canada).

13 To support the development of the *Pan-Canadian Framework on Clean Growth and Climate Change*, four background studies were prepared in 2016 by federal–provincial–territorial working groups: *Clean technology, innovation and jobs*; *Carbon pricing mechanisms*; *Specific mitigation opportunities*; and *Adaptation and climate resilience*.

14 Note: Saskatchewan and Manitoba did not initially sign on to the *Pan-Canadian Framework on Clean Growth and Climate Change*, but Manitoba later signed on in February 2018.



mitigation<sup>15</sup> actions across the economy; 3) adaptation<sup>16</sup> and resilience; and 4) clean technology, innovation and jobs.

Section 3.5 of the Pan-Canadian Framework (included in this report as Appendix A) outlines how the forestry, agriculture and waste sectors could contribute to mitigating the effects of climate change in Canada. Four areas of action are identified:

“(1) enhancing carbon storage in forests and agricultural lands; (2) supporting the increased use of wood for construction; (3) generating fuel from bioenergy and bioproducts; and, (4) advancing innovation.”<sup>17</sup>

Ms. Beth MacNeil, Assistant Deputy Minister, Canadian Forest Service, Natural Resources Canada, informed the Committee of the analyses conducted by Natural Resources Canada and provincial and territorial partners on opportunities for emissions mitigation in forestry, which informed the Pan-Canadian Framework. These analyses revealed the following four main areas of opportunity for forestry: strategic forest management actions (e.g. ensuring maximum use of wood fibre, enhancing forest restoration after fire or insect damage, thinning trees to facilitate the growth of younger trees which sequester carbon at a faster rate); creating new forests; using long-lived wood products to replace more emissions-intensive materials; and generating bioenergy from wood to replace fossil fuels.<sup>18</sup>

## Canada’s Reporting on Greenhouse Gas Sources and Sinks to the United Nations Framework Convention on Climate Change

As agreed to in the United Nations Framework Convention on Climate Change (UNFCCC), which Canada ratified in 1992, Canada reports annually on its anthropogenic GHG sources and sinks through its National Inventory Report.<sup>19</sup> Methodologies and guidelines for reporting are set out by experts with the Intergovernmental Panel on Climate Change

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15 “Mitigation” refers to the reduction of GHG emissions in an effort to reduce or prevent further climate change.

16 “Adaptation” refers to adjustment to the consequences of climate change.

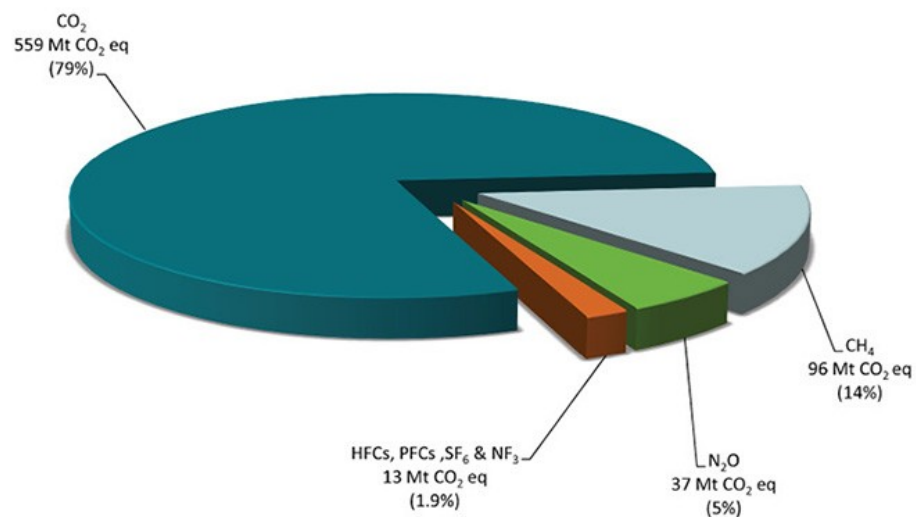
17 Environment and Climate Change Canada, *Pan-Canadian Framework on Clean Growth and Climate Change: Canada’s Plan to Address Climate Change and Grow the Economy*, Gatineau, Environment and Climate Change Canada, 2016, p. 23.

18 ENVI, *Evidence*, 22 November 2018, 1535 (Beth MacNeil, Assistant Deputy Minister, Canadian Forest Service, Department of Natural Resources).

19 Environment and Climate Change Canada, *National Inventory Report 1990-2016: Greenhouse Gas Sources and Sinks in Canada*, 2018, Part 1.

(IPCC).<sup>20</sup> Parties to the UNFCCC report their emissions of seven GHGs: carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulfur hexafluoride (SF<sub>6</sub>), and nitrogen trifluoride (NF<sub>3</sub>).<sup>21</sup> To account for the unique global warming potentials of each greenhouse gas, and to provide a common unit of measurement, greenhouse gases are reported in carbon dioxide equivalents (CO<sub>2</sub> eq or CO<sub>2</sub>e).<sup>22</sup> Figure 1 shows the distribution of Canada's GHG emissions in 2016, the latest year for which data were reported to the UNFCCC in 2018 (at the time of writing). The Government of Canada's output-based carbon pricing system covers emissions from all seven of the UNFCCC GHGs.<sup>23</sup>

**Figure 1: Breakdown of Canada's 2016 Emissions by Greenhouse Gas**



Note: Carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), and nitrous oxide (N<sub>2</sub>O) represent 98% of Canada's emissions, as measured in carbon dioxide equivalent units.

Source: Environment and Climate Change Canada, [National Inventory Report 1990-2016: Greenhouse Gas Sources and Sinks in Canada](#), 2018, Part 1, p. 4.

20 Ibid.

21 Ibid.

22 Environment and Climate Change Canada, [Global warming potentials](#).

23 Environment and Climate Change Canada, [Carbon pricing: regulatory framework for the output-based pricing system](#).



The IPCC defines the following sectors for GHG emissions reporting: <sup>24</sup>

- 1) Energy – Stationary Combustion Sources
  - includes fuel combustion in the manufacturing, construction, and energy industries, as well as commercial and residential sectors;
- 2) Energy – Transport
  - includes emissions from the mobile combustion of various fuel types during major transport activities (i.e., road, off-road, air, railways, and water-borne navigation);
- 3) Energy – Fugitive Sources
  - includes intentional or unintentional release of GHGs during the extraction, processing and delivery of fossil fuels to the point of final use;
- 4) Industrial Processes and Product Use
  - covers non-energy GHG emissions that result from manufacturing processes and the use of products;
- 5) Agriculture
  - covers non-energy GHG emissions relating to the production of crops and livestock;
- 6) Waste
  - includes GHG emissions from the treatment and disposal of liquid and solid wastes; and
- 7) Land Use, Land-Use Change and Forestry
  - includes GHGs emitted and sequestered by Canada’s managed land base (forest, cropland, grassland, wetlands, and settlements) and emissions related to harvested wood products.

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<sup>24</sup> Intergovernmental Panel on Climate Change, [\*2006 IPCC Guidelines for National Greenhouse Gas Inventories\*](#), 2006.

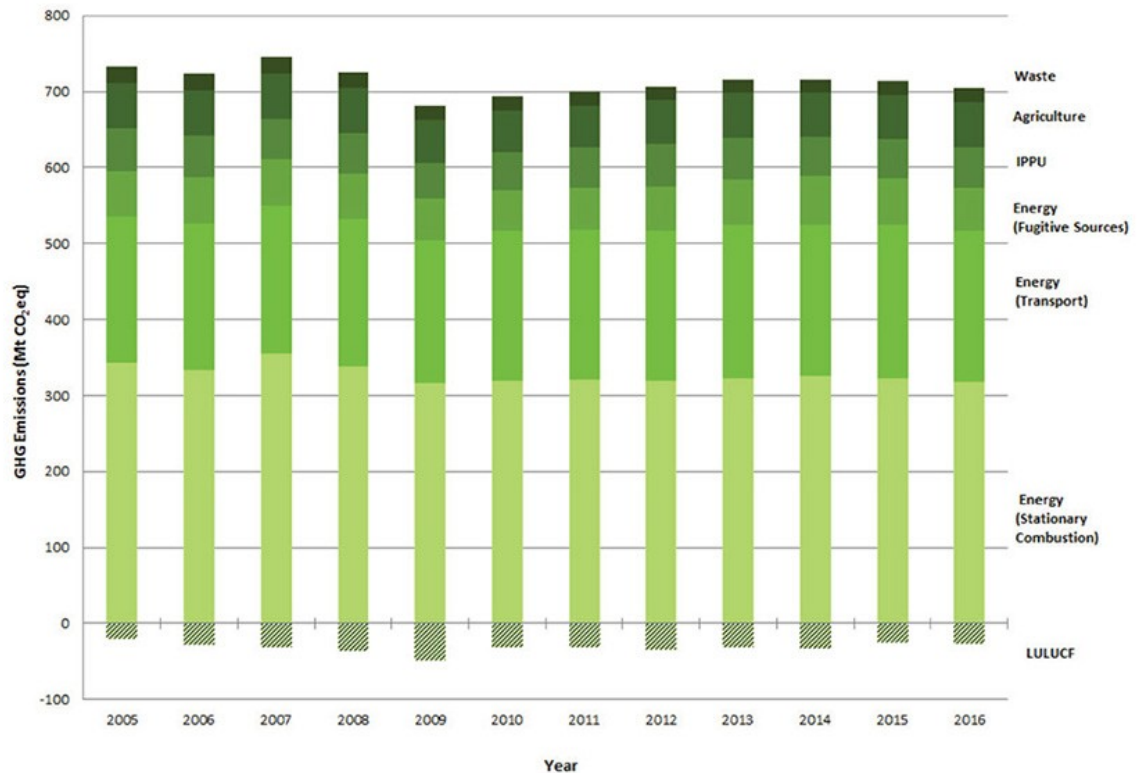


## **Overview of Greenhouse Gas Emissions in the Context of the Forestry, Agriculture and Waste Sectors**

As per the Intergovernmental Panel on Climate Change guidelines, emissions and sinks from Land Use, Land-Use Change and Forestry (LULUCF) are reported separately from the other sectors' emissions and are not counted towards Canada's total GHG emissions. Figure 2 shows Canada's 2016 GHG emissions from energy, industrial processes and product use, agriculture, and waste, with the total amount sequestered by the LULUCF sector included for comparison purposes. In 2016, Canada's total anthropogenic GHG emissions were 704 Mt CO<sub>2</sub> equivalent and the LULUCF sector was responsible for the net sequestration of 28 Mt CO<sub>2</sub> equivalent.



**Figure 2: Trends in Canadian Greenhouse Gas Emissions (2005 to 2016) by the Intergovernmental Panel on Climate Change sectors, including Land-Use, Land-Use Change and Forestry (LULUCF)**



Note: IPPU refers to Industrial Processes and Product Use. LULUCF refers to Land Use, Land-Use Change and Forestry. Descriptions of what is included in each of these reporting sectors are found in the paragraph immediately preceding Figure 1.

Source: Environment and Climate Change Canada, [Greenhouse gas sources and sinks: executive summary 2018](#).

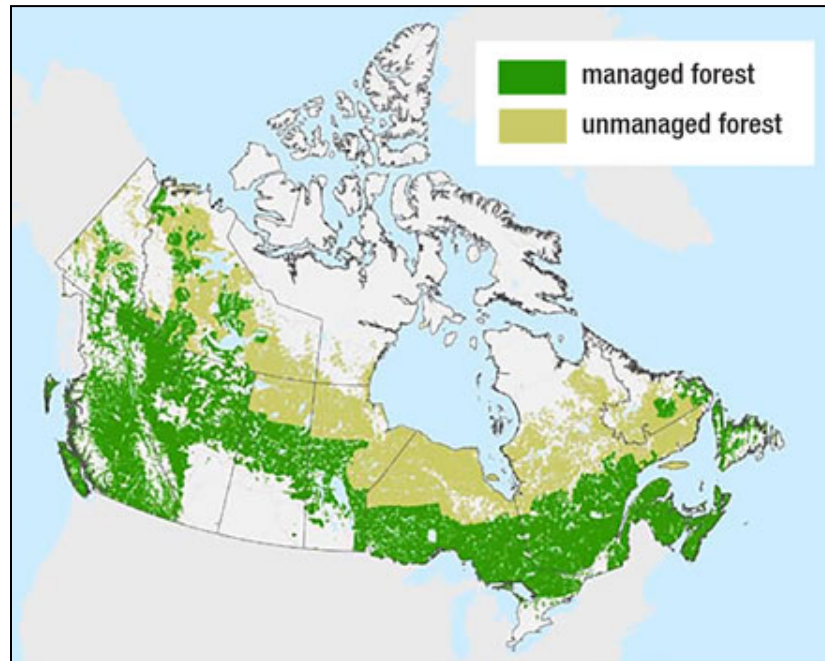
## Forestry

The “managed forest”, for which Canada reports as part of the LULUCF sector, refers to all forests under direct human influence, including areas managed for harvesting, forests under fire or insect management, and protected forests in national and provincial parks.<sup>25</sup> Canada’s managed forest represents about 226 million hectares, or 65% of

<sup>25</sup> Natural Resources Canada, [Indicator: Carbon emissions and removals](#).

Canada's total forest area. All other forests in Canada are considered "unmanaged", as shown in Figure 3.<sup>26</sup>

**Figure 3—Canada's Managed and Unmanaged Forest Area**



Source: Natural Resources Canada, *Indicator: Carbon emissions and removals*.

Carbon storage – also known as carbon sequestration – may refer to the natural and human-led processes of removing carbon from the atmosphere. Carbon sinks are the natural systems that absorb and remove carbon from the atmosphere.<sup>27</sup> Plants capture carbon dioxide from the atmosphere through photosynthesis, acting as a carbon sink. When plants burn or decompose, they release their stored carbon into the atmosphere, acting as a carbon source. Canada's forest area represents a net carbon sink in years that it removes more GHGs from the atmosphere than it releases. In turn, Canada's forest area represents a net carbon source in years that it releases more GHGs to the atmosphere than it removes (as seen in Figure 4).

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26 Ibid.

27 Carbon sinks should not be confused with carbon capture and storage, the anthropogenic process of removing carbon dioxide from the atmosphere and storing it in geological, terrestrial or ocean reservoirs. Natural Resources Canada, *Quick Facts on CO<sub>2</sub> Capture & Storage in Canada*.



Canada's forest carbon budget model forms the basis of Canada's annual national monitoring, accounting, and reporting of managed forest carbon under the UNFCCC.<sup>28</sup> The Canadian Forest Service of Natural Resources Canada developed the forest carbon budget model in 1989 and has since continuously improved upon it, resulting in this innovative tool being internationally recognized and adopted by other countries.<sup>29</sup>

Although Canada's managed forests have been a significant net carbon sink for most of the last century, the increasing number and intensity of wild fires has impacted the carbon balance of Canadian forests. Forest fires are a natural part of the Boreal forest ecosystem and are important for forest regeneration, health, and biodiversity.<sup>30</sup> For example, the high heat of fire is required for the waxy cones of jack pine and lodgepole pine to open and release their seeds.<sup>31</sup> However, forest fires also pose a threat to neighbouring communities, timber resources, and the climate. Since 1990, an average of 2.5 million hectares of forest burn each year in Canada.<sup>32</sup> In fact, Canada's forests have been a net carbon source in some recent years.<sup>33</sup> Insect infestations (e.g., by the spruce budworm in Eastern Canada and by the mountain pine beetle in British Columbia and Alberta) also impact the amount of carbon released from forests.<sup>34</sup>

Figure 4 shows the net GHG emissions over time from Canada's managed forests, as well as annual areas impacted by fire, insect damage, and harvesting. The spikes in GHG emissions in years in which larger areas burned show the importance of fire to annual GHG emissions.

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28 ENVI, *Evidence*, 22 November 2018, 1535 (Beth MacNeil, Assistant Deputy Minister, Canadian Forest Service, Department of Natural Resources).

29 Ibid.

30 Natural Resources Canada *Forest fires*.

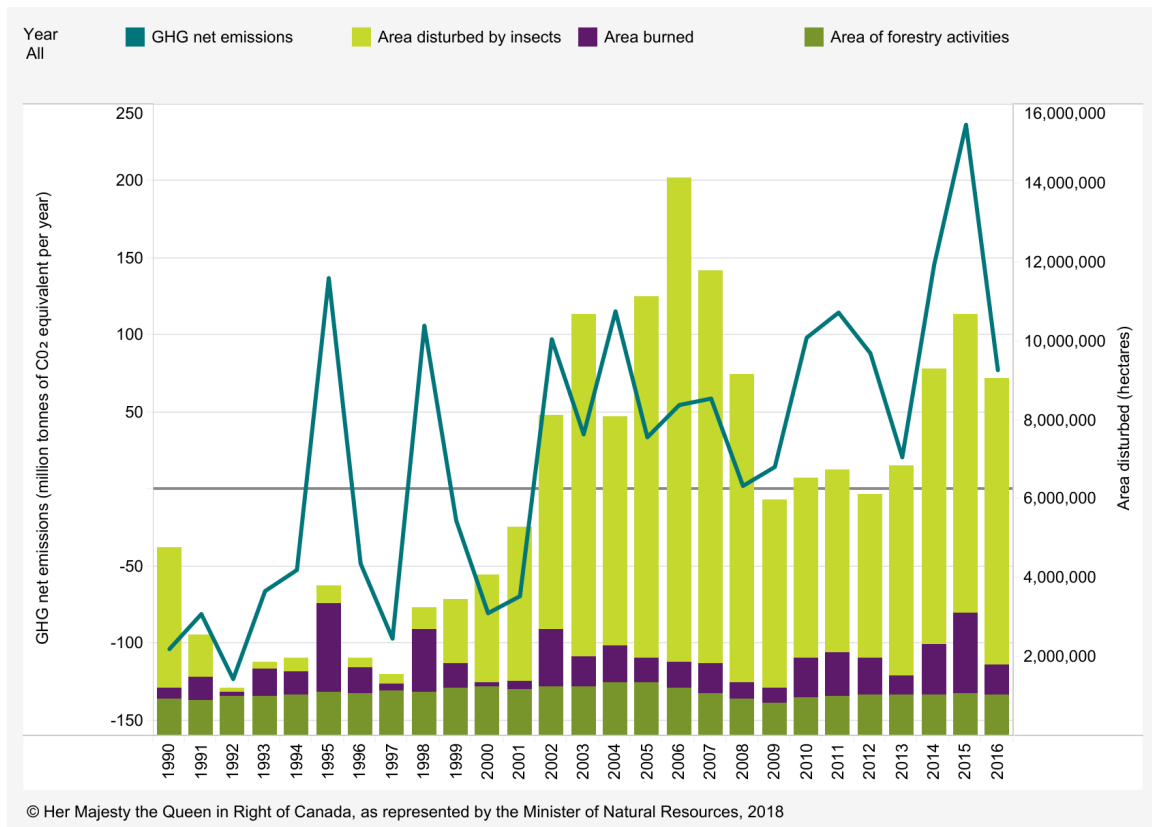
31 Natural Resources Canada, *Fire ecology*.

32 Natural Resources Canada, *Forest fires*.

33 Natural Resources Canada, *Forest carbon*.

34 Ibid.

**Figure 4—Annual Net Carbon Emissions in Canada’s Managed Forest: 1990–2016, Including the Areas Burned, Disturbed by Insects, and Harvested**



Note: Net emissions below zero indicate years for which Canada’s managed forests were a net carbon sink (e.g. 1992), while net emissions above zero indicate years for which Canada’s managed forests were a net carbon source (e.g. 2015).

Source: Natural Resources Canada, *Indicator: Carbon emissions and removals*.

Canada has been a world leader in sustainable forest management practices for more than 20 years. In 1992, the [Canadian Council of Forest Ministers](#) (CCFM) and Canada’s forest sector endorsed the national adoption of sustainable forest management principles.<sup>35</sup> These principles are now enshrined in laws, regulations and policies enacted by the federal, provincial and territorial governments.<sup>36</sup>

Over the last decades, continued improvements in sustainable forestry techniques has decreased the carbon emissions per unit of production in this sector. Mr. Robert

35 Natural Resources Canada, *Sustainable forest management in Canada*.

36 Natural Resources Canada, *Canada’s forest laws*.



Larocque, Senior Vice-president, Forest Products Association of Canada, highlighted that the forest products industry has aggressively reduced its GHG emissions by 66% since 1990. He explained that this was partly accomplished by eliminating coal and almost all oil for energy generation, and instead using biomass residue for energy generation.<sup>37</sup>

When considering how to optimize the role of Canada's managed forests as a net carbon sink to address climate change, Ms. MacNeil explained that one must keep the following three factors in mind: "first, how forest management affects [carbon] emissions and removals; second, the carbon stored in wood products; and third, how forest products and bioenergy can replace other products and fossil fuels that produce more emissions."<sup>38</sup>

The Committee heard that it is helpful to consider the concept of "embodied energy" of a given material when considering the benefits of wood products in construction. Embodied energy refers to "the sum of the energy required to extract, harvest, process, manufacture, transport, construct and maintain a material or product used in building applications."<sup>39</sup> It also includes the use of water, GHG emissions and other air pollutants. As explained by the Canadian Council of Forest Ministers, "Lumber, with an embodied energy value of approximately 2.5 megaJoules per kilogram (MJ/kg), is thus much more environmentally friendly than building materials such as gypsum wallboard (6.1 MJ/kg), glass (15.9 MJ/kg), steel (32 MJ/kg), or aluminum (227 MJ/kg)."<sup>40</sup> Increasing the use of wood products in construction could help reduce the use of more carbon-intensive materials, thus offsetting GHG emissions in the construction industry. In addition, for as long as a wood product remains intact, it continues to store the carbon sequestered by the tree from which it was made.

## Agriculture

Agriculture accounted for 60 megatonnes of CO<sub>2</sub> equivalent (CO<sub>2</sub>e), or about 8.5% of Canada's GHG emissions in 2016.<sup>41</sup> This amount includes GHG emissions resulting from

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37 ENVI, *Evidence*, 29 November 2018, 1555 (Robert Larocque, Senior Vice-President, Forest Products Association of Canada).

38 ENVI, *Evidence*, 22 November 2018, 1535 (Beth MacNeil, Assistant Deputy Minister, Canadian Forest Service, Department of Natural Resources).

39 Canadian Council of Forest Ministers, *Fact Sheet: Canada's Forests: CO<sub>2</sub> Sink or Source?*

40 Ibid.

41 Environment and Climate Change Canada, *National Inventory Report 1990-2016 - Greenhouse Gas Sources and Sinks in Canada: Executive Summary*, 2018, p. 9.

crop and livestock production but does not include energy use on farms (which is reported to the UN as part of the Energy – Stationary Combustion Sources sector). In that same year, agriculture also accounted for 30% of Canada’s methane (CH<sub>4</sub>) emissions and 77% of national nitrous oxide (N<sub>2</sub>O) emissions. Significantly, methane and nitrous oxide have a much greater global warming potential than carbon dioxide. One unit of methane is equivalent to 25 units of carbon dioxide, while one unit of nitrous oxide is equivalent to 298 units of carbon dioxide.<sup>42</sup>

Canada’s *National Inventory Report 1990-2016* breaks down agriculture-related GHG emissions into five categories: enteric fermentation; manure management; agricultural soils; field burning of agricultural residues; and liming, urea application and other carbon-containing fertilizers.<sup>43</sup> As the following table shows, GHG emissions in the agricultural sector increased from 1990 to 2005, but have remained relatively stable since 2005.

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42 Environment and Climate Change Canada, *Global warming potentials*.

43 Environment and Climate Change Canada, *National Inventory Report 1990-2016 - Greenhouse Gas Sources and Sinks in Canada: Executive Summary*, 2018, p. 9.

**Table 1 – Canada’s Total Greenhouse Gas Emissions in Agriculture**

| Years  | 1990 | 1995 | 2000 | 2005 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|--|------|------|------|------|------|------|------|------|------|------|------|
| Megatonnes CO <sub>2</sub> equivalent  |      |      |      |      |      |      |      |      |      |      |      |
| AGRICULTURE<br>TOTAL EMISSIONS   | 47   | 54   | 57   | 60   | 56   | 55   | 57   | 59   | 58   | 59   | 60   |
| Enteric<br>Fermentation  | 22   | 27   | 28   | 31   | 26   | 25   | 25   | 25   | 25   | 24   | 25   |
| Manure<br>Management   | 6.6  | 7.7  | 8.5  | 9.3  | 8.2  | 8.1  | 8.1  | 8.2  | 8.2  | 8.3  | 8.4  |
| Agricultural Soils   | 17   | 18   | 19   | 19   | 21   | 20   | 22   | 24   | 23   | 23   | 24   |
| Field Burning of<br>Agricultural<br>Residues                                 | 0.23 | 0.18 | 0.13 | 0.05 | 0.03 | 0.03 | 0.04 | 0.05 | 0.05 | 0.05 | 0.05 |
| Liming, Urea<br>Application and<br>Other Carbon<br>containing<br>Fertilizers | 1.2  | 1.4  | 1.6  | 1.4  | 1.8  | 2.0  | 2.3  | 2.7  | 2.5  | 2.6  | 2.5  |

Note: Totals may not add up due to rounding.

Source: Data from Canada’s National Inventory Submission to the United Nations Framework Convention on Climate Change. UNFCCC, [National Inventory Submissions 2018](#), Common Reporting Format, submitted by Canada on 13 April 2018.

The growth in GHG emissions in the agriculture sector from 1990 to 2005 is explained for the most part by growing beef cattle and swine populations which increased GHG emissions from enteric fermentation and manure (the main sources of methane emissions in agriculture). Between 1990 and 2005, populations of both cattle and swine grew from around 10 million head each to 15 million head each.<sup>44</sup> After peaking in 2005, both populations decreased in the following years. Canada’s cattle population had declined to 12 million head in 2016, while the swine population dropped to 12.5 million head in 2010 before growing back to 14 million head by 2016.

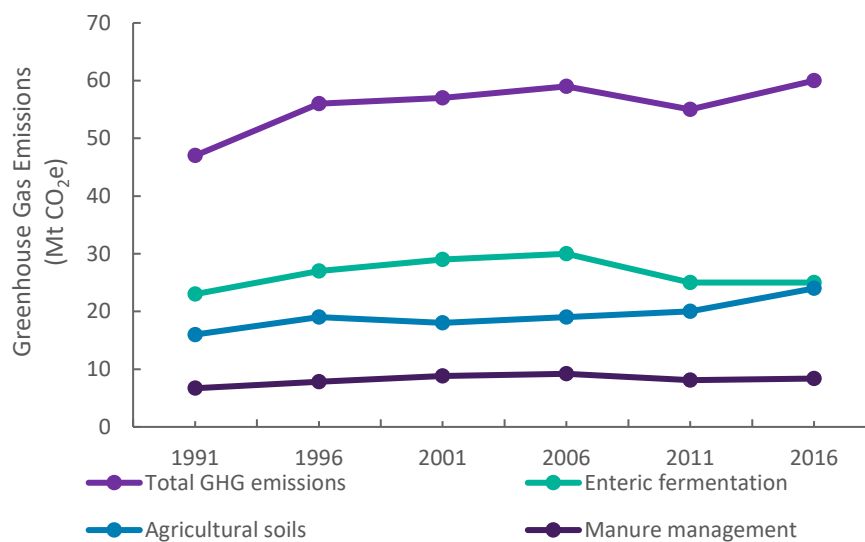
From 1990 to 2016, the increased use of inorganic nitrogen fertilizers (the main source of nitrous oxide emissions in agriculture) has been driving agricultural soils emissions

44 Environment and Climate Change Canada, [National Inventory Report 1990-2016, Greenhouse Gas Sources and Sinks in Canada](#), Canada’s Submission to the United Nations Framework Convention on Climate Change, Part 1, 2018, p. 130.



upward.<sup>45</sup> Over this period, agricultural soils emissions grew from 17 Mt CO<sub>2</sub>e to 24 Mt CO<sub>2</sub>e. Figure 5 illustrates the GHG emissions trends for the three main sources of emissions in agriculture: enteric fermentation, manure management and agricultural soils.

**Figure 5—Main Sources of Greenhouse Gas Emissions in Agriculture, 1991-2016**



Source: Adapted from Environment and Climate Change Canada, *National Inventory Report 1990-2016 - Greenhouse Gas Sources and Sinks in Canada: Executive Summary*, 2018, p. 9; Data from Canada’s National Inventory Submission to the United Nations Framework Convention on Climate Change. UNFCCC, *National Inventory Submissions 2018*, Common Reporting Format, submitted by Canada on 13 April 2018.

While agricultural soils emitted 24 Mt of CO<sub>2</sub>e in 2016, they also removed 11 Mt of CO<sub>2</sub>e from the atmosphere in that year.<sup>46</sup> Canada’s cropland<sup>47</sup>, as referred to in the *Land Use, Land-Use Change and Forestry Section* of the *National Inventory Report*, emitted 7.2 Mt of CO<sub>2</sub>e in 1991. But, as a result of changes in agricultural practices, especially in the

45 Environment and Climate Change Canada, *National Inventory Report 1990-2016 - Greenhouse Gas Sources and Sinks in Canada: Executive Summary*, 2018, p. 11.

46 Ibid.

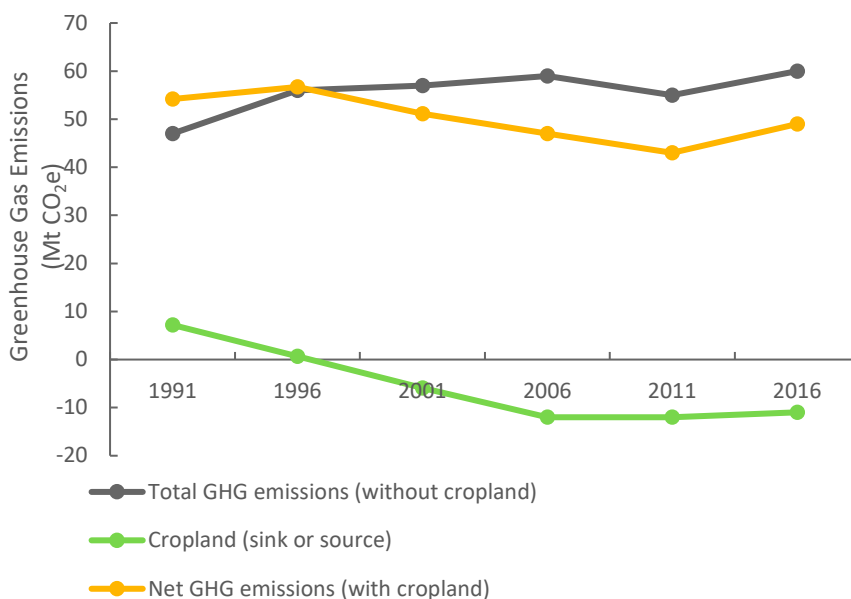
47 Cropland is part of the IPCC reporting sector of Land Use, Land-Use Change and Forestry Sector. “Cropland” includes the management practices on agricultural lands (summer fallow, perennial crops, etc.) and the emissions from lands that are converted into cropland. Environment and Climate Change Canada, *National Inventory Report 1990-2016: Greenhouse Gas Sources and Sinks in Canada, Part 3*.



Prairies,<sup>48</sup> cropland had become a carbon sink by 1997 (0.86 Mt CO<sub>2</sub>e) and has since increased its carbon storage capacity.<sup>49</sup> Between 2005 and 2016, Canada’s cropland captured and stored between 10 and 12 Mt CO<sub>2</sub>e each year.<sup>50</sup>

In Canada’s reporting to the UNFCCC, carbon capture and storage by cropland is not accounted for in Canada’s total GHG emissions from the Agriculture sector, but is accounted for in the LULUCF sector. If agriculture’s carbon storage were reported with its emissions, agriculture’s *net* emissions would have decreased from 54 to 49 Mt CO<sub>2</sub>e between 1991 and 2016, even though GHG emissions increased from 47 to 60 Mt CO<sub>2</sub>e during that time, as shown in Figure 6.

**Figure 6—Agricultural GHG Emissions in Canada with and without Cropland, 1991-2016**



Source: Adapted from Environment and Climate Change Canada, [National Inventory Report 1990-2016 - Greenhouse Gas Sources and Sinks in Canada: Executive Summary](#), 2018, p. 9; Data from Canada’s National Inventory Submission to the United Nations Framework Convention on

48 Agriculture and Agri-Food Canada, [Agricultural Greenhouse Gas Indicator, July 2016](#).

49 UNFCCC, [National Inventory Submissions 2018](#), Common Reporting Format, submitted by Canada on 13 April 2018.

50 Ibid.

Climate Change. UNFCCC, [National Inventory Submissions 2018](#), Common Reporting Format, submitted by Canada on 13 April 2018.

## Waste

Waste treatment and disposal accounted for 2.6% of Canada's GHG emissions in 2016 (19 Mt).<sup>51</sup> Municipal solid waste (12.9 Mt) and wood waste landfills (3.5 Mt) account for the vast majority of GHG emissions from this sector.<sup>52</sup> A major concern regarding waste is that the anaerobic decomposition of organic waste in landfills produces methane gas. Since methane produces 25 times the greenhouse effect of the same amount of carbon dioxide, limiting methane production and release to the atmosphere is important to mitigating climate change. Landfill gas can be captured and combusted to generate electricity or to heat buildings, which has two major benefits: 1) it prevents methane from escaping to the atmosphere and; 2) the energy generated from landfill gas can reduce the need for energy generation from fossil fuel sources such as coal, oil, or natural gas.<sup>53</sup>

Environment and Climate Change Canada notes that, while landfill gas recovery is a method to deal with the organic materials already in landfills, diverting organic materials such as food and yard waste from landfills (e.g. by using composting) would reduce the production of methane in the first place.<sup>54</sup> Organic matter typically undergoes aerobic decomposition during composting, which results in the production of carbon dioxide instead of the more potent GHG: methane. Therefore, waste management that diverts as much organic waste as possible from landfills is one opportunity to reduce GHGs from the waste sector.

Another important aspect of waste management is the waste management hierarchy, often referred to as the 3Rs: reduce, reuse, recycle. Quite simply, the 3Rs are a reminder to first try to reduce the amount of waste produced; secondly to reuse products to the extent possible and, finally, to recycle materials rather than sending them to landfill.<sup>55</sup>

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51 Environment and Climate Change Canada, [Greenhouse gas sources and sinks: executive summary 2018](#).

52 Ibid.

53 Environment and Climate Change Canada, [Municipal solid waste and greenhouse gases](#).

54 Ibid.

55 Environment and Climate Change Canada, [Reducing municipal solid waste](#).



## FINDINGS OF STUDY

### Introduction

The following sections present the Committee’s findings on how the federal government can help accelerate GHG emissions reductions in the forestry, agriculture, and waste management sectors. Findings are organized according to sector.

### Forestry

Ms. MacNeil, Assistant Deputy Minister, Canadian Forest Service, Natural Resources Canada, reminded the Committee that, due to the long time it takes for trees to accumulate biomass, actions need to be taken now in order to take advantage of forests’ potential to represent one of Canada’s largest carbon emissions mitigation opportunities by 2050.<sup>56</sup> Mr. Tony Lemprière, Senior Manager, Climate Change Policy, Canadian Forest Service, Natural Resources Canada, clarified for the Committee that, under the *Paris Agreement*, countries are encouraged to use their land base, such as managed forests, to achieve their emissions reduction targets, and that Canada would be doing so.<sup>57</sup> When asked how Canada could best increase the absorption of carbon by Canada’s forests, Mr. Tony Lemprière summarized the Canadian Forest Service’s input as follows:

Create new forests. Manage forests to increase the sink and reduce fire risk. Use wood. Build with wood, and use waste wood for energy. Put it to some purpose.<sup>58</sup>

### Carbon Storage in Forests and Wood

A number of witnesses spoke about how harvesting trees and maintaining their stored carbon in long-lived wood products could assist in meeting Canada’s GHG emissions reduction targets. Ms. MacNeil noted that, although forest conservation is important, it is “often not the most effective long-term GHG emissions strategy,” since trees will release their stored carbon when they decompose or burn. Ms. Kate Lindsay of the Forest Products Association of Canada elaborated on this point, stating that keeping forests as part of a working landscape – harvesting wood, making products that store

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56 ENVI, *Evidence*, 22 November 2018, 1540 (Beth MacNeil, Assistant Deputy Minister, Canadian Forest Service, Department of Natural Resources).

57 ENVI, *Evidence*, 22 November 2018, 1700 (Tony Lemprière, Senior Manager, Climate Change Policy, Canadian Forest Service, Department of Natural Resources).

58 ENVI, *Evidence*, 22 November 2018, 1720 (Tony Lemprière, Senior Manager, Climate Change Policy, Canadian Forest Service, Department of Natural Resources).

carbon for decades and centuries, and then regrowing those forests – maximizes forests’ carbon storage potential.<sup>59</sup> Mr. Stéphane Renou, President and Chief Executive Officer, FPInnovations expressed that “wood is one of those rare materials with a small carbon footprint” and emphasized to the Committee:

The most important thing to remember is that, in construction, wood sequesters carbon and, in the forest, helps to increase carbon reservoirs.<sup>60</sup>

Mr. Larocque, Senior Vice-President, Forest Products Association of Canada, noted that changes to the *National Building Code* in 2020 will allow for the construction for tall wood buildings of up to 12 stories. He added that this will facilitate increased long term storage of carbon and that the Forest Product Association of Canada was looking forward to the new code.<sup>61</sup> Mr. Larocque observed that government assistance to open up markets for tall wood buildings would further accelerate the long-term storage of carbon in this way.<sup>62</sup>

The Committee asked Dr. Werner Kurz, Senior Research Scientist, Canadian Forest Service, Natural Resources Canada, what kind of plantings average Canadians should consider for their own land if they would like to help increase Canada’s carbon sink. Dr. Kurz advised:

Fifty per cent of the weight of wood is carbon, so basically it’s [...] any woody plant that grows fast and has a high density in its wood. An oak will have a higher density than a poplar, but it grows more slowly. At the end of the day, it comes down to how much carbon you can accumulate in the wood, in your forests, in your urban forests, in your parklands, and in your shelter belts. We have plenty of opportunities across the country to grow more trees and to remove more carbon dioxide from the atmosphere in the process.<sup>63</sup>

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59 ENVI, *Evidence*, 29 November 2018, 1705 (Kate Lindsay, Vice-President, Sustainability and Environmental Partnerships, Forest Products Association of Canada).

60 ENVI, *Evidence*, 6 December 2018, 1535 (Stéphane Renou, President and Chief Executive Officer, FPInnovations).

61 ENVI, *Evidence*, 29 November 2018, 1600 (Robert Larocque, Senior Vice-President, Forest Products Association of Canada).

62 ENVI, *Evidence*, 29 November 2018, 1620 (Robert Larocque, Senior Vice-President, Forest Products Association of Canada).

63 ENVI, *Evidence*, 22 November 2018, 1725 (Werner Kurz, Senior Research Scientist, Canadian Forest Service, Department of Natural Resources).



## Observation 1

**The Committee encourages Canadian landowners to consider enhancing Canada's carbon sink when managing their lands.**

### Bioproducts and Bioenergy from Forestry

Mr. Larocque of the Forest Products Association of Canada acknowledged that years of ongoing federal support for research has allowed the bioproducts industry to advance to its current state.<sup>64</sup> He gave examples of bioproducts such as cross-laminated timber (which facilitates the construction of tall wood buildings), wood fibre insulation, and wood fibre composite which can be used in place of heavier plastics in vehicles.<sup>65</sup> Mr. Renou of FPIinnovations noted that the development of cross-laminated timber was led by FPIinnovations, a non-profit organization funded by industry and provincial and federal governments.<sup>66</sup> Mr. Renou specified that the production and use of bioplastics have been shown to result in 80% fewer GHG emissions than that of conventional polypropylene plastics.<sup>67</sup>

Mr. Larocque identified a gap in federal incentives for sequestering carbon in biomaterials or wood products that will store carbon over the long term. He described a number of federal policies that promote the use of forest bioenergy, including carbon pricing, but he noted that comparable incentives for bioproducts and biomaterials are lacking.<sup>68</sup> Mr. Larocque called on the Committee to address this gap.<sup>69</sup> In order to promote the use of products that provide long-term carbon storage or offer a lower carbon footprint than their alternatives:

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64 ENVI, [Evidence](#), 29 November 2018, 1630 (Robert Larocque, Senior Vice-President, Forest Products Association of Canada).

65 ENVI, [Evidence](#), 29 November 2018, 1600 and 1705 (Robert Larocque, Senior Vice-President, Forest Products Association of Canada).

66 ENVI, [Evidence](#), 6 December 2018, 1535 (Stéphane Renou, President and Chief Executive Officer, FPIinnovations).

67 Ibid.

68 ENVI, [Evidence](#), 29 November 2018, 1625 (Robert Larocque, Senior Vice-President, Forest Products Association of Canada).

69 ENVI, [Evidence](#), 29 November 2018, 1625 and 1630 (Robert Larocque, Senior Vice-President, Forest Products Association of Canada).

## Recommendation 1

**The Committee recommends that Natural Resources Canada explore incentives to promote the use of bioproducts and biomaterials, as are in place for bioenergy.**

Mr. Doug Hooper, Director, Policy and Regulations, Advanced Biofuels Canada, discussed the potential for advanced biofuels to reduce GHGs in Canada.

Under the clean fuel standard, we anticipate that clean fuels will replace liquid fossil fuels to deliver at least 20 million tonnes per year of greenhouse gas reductions by 2030... These reductions will come largely from advanced biofuels that are commercially established today—biodiesel, renewable diesel, ethanol and advanced ethanol. Emerging technologies such as biocrude and carbon capture are in the pilot and demonstration stage. They will expand clean fuel supplies and enable the deeper reductions that are necessary to meet our 2050 targets.<sup>70</sup>

Mr. Hooper described to the Committee how the biofuels industry assesses its sustainability relative to conventional fuels. Biofuels producers may conduct life-cycle carbon intensity analysis to compare their products to other fuels across their full life cycle.<sup>71</sup> When asked by the Committee about concerns that biofuels use crops that could otherwise feed people, Mr. Hooper explained that producers may specify the renewable biomass content of their biofuels (e.g. harvest residue) in order to address such concerns.<sup>72</sup>

Dr. Susan Wood-Bohm brought to the Committee's attention an opportunity for the federal government to demonstrate leadership in bioenergy. She informed the members that approximately half of the GHG emissions from the federal government itself are associated with heating government buildings. Of those, she noted that the military installation across Canada already work on distributed heat systems, whereby multiple buildings are heated through the same heat system. Dr. Wood-Bohm is of the opinion that changing to a lower-emitting fuel source for these distributed heat systems would be a very simple way to substantially reduce emissions, and she called upon the federal government to play a leadership role in this regard.<sup>73</sup> Furthermore, she discussed forestry and agriculture biomass residue as an underused source of bioenergy in

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70 ENVI, *Evidence*, 11 December 2018, 1555 (Doug Hooper, Director, Policy and Regulations, Advanced Biofuels Canada).

71 ENVI, *Evidence*, 11 December 2018, 1630 (Doug Hooper, Director, Policy and Regulations, Advanced Biofuels Canada).

72 Ibid.

73 ENVI, *Evidence*, 6 December 2018, 1600 (Susan Wood-Bohm, As an individual).



Canada.<sup>74</sup> In order for the Government of Canada to lead by example and reduce its GHG emissions:

## Recommendation 2

**The Committee recommends that Public Services and Procurement Canada work with all government departments and agencies to identify fuel switching and other opportunities to decrease the greenhouse gas emissions from federal buildings and vehicle fleets.**

### Use of Forest Harvest Residues for Bioenergy

Mr. Gordon Murray, Executive Director, Wood Pellet Association of Canada, explained that wood pellets are a renewable fuel made from pure, compressed waste wood or logging residue.<sup>75</sup> He informed the Committee that approximately 95% of wood pellets are used for power generation, including to replace coal in pulverized coal power plants.<sup>76</sup>

Mr. Murray noted that Canada produces less than 10% of the world's wood pellets and that the Canadian market for wood pellets is very small. One of the challenges experienced by the Wood Pellet Association of Canada is their members' access to logging waste. The forest industry is required to dispose of leftover "slash" (logging residue such as tree tops) and wood residue to reduce the risk of fire.<sup>77</sup> Mr. Murray informed the Committee that slash is often burned at the logging site for disposal, and that many primary forest tenure holders prefer this method of disposal, particularly when logging sites are difficult to access.<sup>78</sup> Mr. Murray noted that the wood pellet industry seeks greater access to the logging residue from primary forest tenure holders.<sup>79</sup> The wood pellet industry advocates for provincial governments to limit slash burning, thereby leaving more residue available for bioenergy.<sup>80</sup> The Committee also

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74 Ibid.

75 ENVI, *Evidence*, 6 December 2018, 1540 (Gordon Murray, Executive Director, Wood Pellet Association of Canada).

76 Ibid.

77 Government of British Columbia, "Slash and Wood Residue Burning", *Industrial Burning*.

78 ENVI, *Evidence*, 6 December 2018, 1540 (Gordon Murray, Executive Director, Wood Pellet Association of Canada).

79 Ibid.

80 Ibid.



noted that trees killed by insect damage or other natural disturbances on government properties represent a further opportunity for the production of bioenergy.

### **Observation 2**

**The Committee encourages provinces, territories, and interested governments to facilitate the use of more forest residues for bioenergy.**

Mr. Murray informed the Committee that existing coal power plants can be converted to burn renewable and sustainable wood pellets with very little capital investment, thereby greatly reducing GHGs.<sup>81</sup> Mr. Murray sees wood pellets as a solution for the provinces which still rely on some coal-powered electricity but have committed to phase out coal by 2030 (i.e. Alberta, Saskatchewan, New Brunswick, and Nova Scotia).<sup>82</sup> However, Mr. Murray added that the Wood Pellet Association of Canada has not had success convincing power companies to convert coal power plants to wood pellets, with the exception of one power plant managed by Ontario Power Generation.<sup>83</sup> In order to reduce GHG emissions from electricity generation:

### **Observation 3**

**The Committee encourages provinces, territories, interested governments and power companies to consider converting coal-fired power plants to burn wood pellets.**

One barrier Mr. Murray identified to the use of wood pellets for heating in Canada is “the incompatibility between European and Canadian boiler pressure standards.”<sup>84</sup> He explained that, although Europe has advanced boiler technology, and although there are no North American biomass boiler manufacturers, European boilers cannot be used in Canada as they do not conform to Canadian pressure standards.<sup>85</sup>

### **Observation 4**

**The Committee encourages the Wood Pellet Association of Canada to continue working with the Canadian Standards Association, and within the provisions of the Canada-**

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81 ENVI, *Evidence*, 6 December 2018, 1545 (Gordon Murray, Executive Director, Wood Pellet Association of Canada).

82 Ibid.

83 Ibid.

84 Ibid.

85 Ibid.



## European Union Comprehensive Economic and Trade Agreement, towards addressing the issue of boiler pressure standards compatibility.

### Forest Greenhouse Gas Emissions from Natural Disturbances: Fire and Insects

The Committee was interested in GHG emissions from forest fires and how these emissions are accounted for in Canada's UNFCCC national inventory reporting. Ms. MacNeil of the Canadian Forest Service stated that a changing climate has resulted in challenging conditions for forests, including increased frequency and magnitude of forest fires and enhanced insect outbreaks, such as that of the mountain pine beetle.<sup>86</sup> Dr. Werner Kurz, Senior Research Scientist, Canadian Forest Service, Natural Resources Canada, explained that emissions from forest fires vary greatly between years, with direct emissions from forest fires as high as 250 million tonnes of CO<sub>2</sub> equivalent in extreme years.<sup>87</sup> He noted that there have been very few extreme years like that since international GHG emissions reporting began in 1990. However, Dr. Kurz cautioned the Committee to consider these emissions within the context of the full forest carbon cycle:

[Y]ou have to remember that much of the boreal forest across Canada is regrowing following forest fires. Yes, you have the direct emissions, but you also have vast areas of forest that are removing carbon dioxide from the atmosphere. By looking just at the emissions, you're not getting the full picture. You really have to look at both, the emissions and the removals, because it's a life-cycle process: forests grow, forests die and burn, forests regrow.<sup>88</sup>

Dr. Kurz clarified that the present average area burned annually is approximately 1% of Canada's forest area.<sup>89</sup> He noted that warming temperatures, reduced precipitation, and increased periods of drought have led to a forest fire increase of three times the area annually burned over the last 50 years.<sup>90</sup> In comparing the impacts of fire and insect outbreaks, Dr. Kurz explained that, in British Columbia, the area affected by insects is far

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86 ENVI, *Evidence*, 22 November 2018, 1540 (Beth MacNeil, Assistant Deputy Minister, Canadian Forest Service, Department of Natural Resources).

87 ENVI, *Evidence*, 22 November 2018, 1635 (Werner Kurz, Senior Research Scientist, Canadian Forest Service, Department of Natural Resources).

88 ENVI, *Evidence*, 22 November 2018, 1640 (Werner Kurz, Senior Research Scientist, Canadian Forest Service, Department of Natural Resources).

89 ENVI, *Evidence*, 22 November 2018, 1640 (Werner Kurz, Senior Research Scientist, Canadian Forest Service, Department of Natural Resources).

90 ENVI, *Evidence*, 22 November 2018, 1555 (Werner Kurz, Senior Research Scientist, Canadian Forest Service, Department of Natural Resources).

greater than the area affected by fires. However, he clarified that the intensity of impact from fire is far greater than that from insect damage. Insect outbreaks typically only kill 30% to 50% of trees while wildfire typically kills nearly 100% of the trees.<sup>91</sup>

Mr. Larocque of the Forest Products Association of Canada brought to the Committee's attention an opportunity to accelerate reforestation following fire and insect damage. He explained that the forest industry replants their harvested areas, as they are required to do. He noted, however, that "no one is really responsible for regenerating areas that are affected by natural disturbances where trees can sometimes take longer to come back. The implementation of such a strategy would capture carbon from the atmosphere more rapidly through faster regeneration."<sup>92</sup> In order to enhance carbon sequestration by Canada's forests:

### **Recommendation 3**

**The Committee recommends that Natural Resources Canada work with provinces, territories, interested governments, and industry to develop and implement a regeneration strategy or program for forests affected by natural disturbances, as is already required for harvested areas.**

### **Forest Fire Suppression and Prevention**

Members of the Committee were interested in the importance of forest fire suppression in preventing direct GHG emissions. Dr. Kurz clarified that most of Canada's forest fires are caused by lightning and occur in remote areas without the infrastructure required to effectively suppress them.<sup>93</sup> Dr. Kurz cautioned that, due to climatic conditions, forest fire intensity has increased to the point that fire suppression may not always be effective.<sup>94</sup> Dr. Kurz further informed the Committee that, in some parts of Canada, an

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91 ENVI, *Evidence*, 22 November 2018, 1700 (Werner Kurz, Senior Research Scientist, Canadian Forest Service, Department of Natural Resources).

92 ENVI, *Evidence*, 29 November 2018, 1600 (Robert Larocque, Senior Vice-President, Forest Products Association of Canada).

93 ENVI, *Evidence*, 22 November 2018, 1650 (Werner Kurz, Senior Research Scientist, Canadian Forest Service, Department of Natural Resources).

94 ENVI, *Evidence*, 22 November 2018, 1655 (Werner Kurz, Senior Research Scientist, Canadian Forest Service, Department of Natural Resources).



unintended consequence of a century of fire suppression is a build-up of forest fire fuel loads.<sup>95</sup>

Ms. MacNeil noted that existing fire suppression resources are not sufficient to deal with the increasing magnitude and frequency of forest fires in Canada. She added that the September 2018 Canadian Council of Forest Ministers meeting tasked federal and British Columbia deputy ministers with developing a list of priority actions required to start addressing Canada's new forest fire regime. Ms. MacNeil explained that Natural Resources Canada is working with provincial partners and with Public Safety Canada on a costed emergency fire management strategy. In order to reduce GHG emissions from increasingly frequent and large forest fires:

#### **Recommendation 4**

**The Committee recommends that Natural Resources Canada work with provinces, territories, interested governments, and industry to increase funding as required for the ecologically-appropriate suppression of forest fires.**

The Committee heard that, in some areas, landscape management could help reduce fire risk. For example, Dr. Kurz noted that, in the interior of British Columbia, having vast areas of contiguous forests contributes to having very large fires when fire does break out, and that, "Designing a landscape that has more of a matrix of grasslands and forests may help reduce fire risks."<sup>96</sup> Dr. Kurz expects that further research into this area will take place.

#### **Recommendation 5**

**The Committee recommends that Natural Resources Canada work with provinces, territories, interested governments and research partners to further research ecological landscape design to appropriately manage forest fires.**

## **Agriculture**

Several witnesses expressed to the Committee how Canadian farmers have already made significant efforts to reduce the amount of GHG emissions per acre of land, or

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95 ENVI, *Evidence*, 22 November 2018, 1555 (Werner Kurz, Senior Research Scientist, Canadian Forest Service, Department of Natural Resources).

96 ENVI, *Evidence*, 22 November 2018, 1725 (Werner Kurz, Senior Research Scientist, Canadian Forest Service, Department of Natural Resources).

tonne of livestock produced.<sup>97</sup> As Dr. Mike Moffatt, Senior Director, Smart Prosperity Institute, described to the Committee:

Canada is already a greenhouse gas[-]efficient producer of crops and livestock. The sector has more than doubled the value of its output over the past decade or so, while keeping emissions near constant, which has caused the sector's overall greenhouse gas emissions intensity to decline by 0.9% per year from 1990 to 2012. Due to improved feeding practices and other factors, we are also one of the most greenhouse gas-efficient animal protein producers in the world.<sup>98</sup>

Dr. Moffatt also argued that Canada's efficient agriculture could help in reducing global GHG emissions if it displaces higher-emitting production: "Canada's export market share could potentially decrease global greenhouse gas emissions, if our production is causing production in other jurisdictions to decline."<sup>99</sup>

### Changes in Agriculture Management Practices

Innovative and sustainable farming techniques, such as no-till (or zero-till) farming, precision nutrient application, better livestock feeding, and genomics, have helped reduce the carbon intensity of crop and livestock production in Canada. Changing agriculture management practices should continue the decoupling between agricultural production and GHG emissions and increase the agricultural soil carbon storage potential. Also, increasing the use of agriculture biofuels may help Canada achieve the objectives of its 2030 Clean Fuel Standard.

### Zero Tillage Farming

Several witnesses mentioned the importance of zero tillage, or low tillage, farming methods as a way for farmers to reduce their use of machinery and related fuel. Susie

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97 ENVI, [Evidence](#), 29 November 2018, 1540 (Don McCabe, Director, Biological Carbon Canada); ENVI, [Evidence](#), 27 November 2018, 1535 (Mike Moffatt, Senior Director, Smart Prosperity Institute); ENVI, [Evidence](#), 29 November 2018, 1630 (Nevin Rosassen, Chairman, Biological Carbon Canada); ENVI, [Evidence](#), 4 December 2018, 1540 (Brian Innes, Vice-President, Public Affairs, Canola Council of Canada); ENVI, [Evidence](#), 4 December 2018, 1600 (Ron Bonnett, President, Canadian Federation of Agriculture); ENVI, [Evidence](#), 11 December 2018, 1635 (Doug Hooper, Director, Policy and Regulations, Advanced Biofuels Canada); ENVI, [Evidence](#), 11 December 2018, 1550 (Kristin Baldwin, Director, Stakeholder Relations, Agricultural Institute of Canada).

98 ENVI, [Evidence](#), 27 November 2018, 1535 (Mike Moffatt, Senior Director, Smart Prosperity Institute).

99 Ibid.



Miller, Executive Director, Canadian Roundtable for Sustainable Crops, described the different tillage methods to the Committee:

[W]hat full tillage means, as defined by Statistics Canada, is the sort of traditional ploughing, where most of the crop residue is reintroduced into the soil and the soil is basically bare. Reduced tillage retains most of the crop residue on the surface; it's not ploughed under, it's on the surface. No[-]till means no disturbance at all; the seeding is done under the soil with equipment that goes in directly.<sup>100</sup>

Ms. Miller explained that no-till farming has a great potential to reduce carbon emissions from agricultural soils and has been adopted by many farmers in Canada's Prairie Provinces:

By adopting seeding and weed control practices that do not disturb the soil, the carbon remains in the soil. It's not released every year, and the growing process continues to add carbon, up to a limit. In 1991, only 10% of Saskatchewan was no[-]till. By 2016, it was 74%, with an additional 20% in reduced tillage. That's a 94% change from conventional tillage to none or reduced.<sup>101</sup>

Similarly, the Committee heard from representatives of the canola industry who mentioned that canola farmers have increasingly adopted no-till farming practices in the last three decades, with significant benefits in terms of GHG emissions reduction:

In 1991, only 7% of western Canadian farmland was seeded with no-till practices. By 2016, this number had dramatically increased to 65%. This change was triggered by the adoption of genetically modified herbicide-tolerant canola. When soils are left untilled, they sequester greenhouse gases. Because of such practices as no-till farming, Canadian cropland now sequesters 11 million tonnes of greenhouse gases every year.<sup>102</sup>

Witnesses stressed that, in addition to environmental considerations, no-till farming is financially beneficial to farmers. Since no-till farming allows farmers to reduce or even stop summer fallow on their land, they can maximize their land use, increase their production (by up to 20% in some cases), and grow their income.<sup>103</sup>

Some witnesses drew attention to the fact that there are limitations to the adoption of no-till farming technologies. As Susie Miller explained: “[t]he technology is not suited to

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100 ENVI, *Evidence*, 27 November 2018, 1540 (Susie Miller, Executive Director, Canadian Roundtable for Sustainable Crops).

101 Ibid.

102 ENVI, *Evidence*, 4 December 2018, 1550 (Rick White, Chief Executive Officer, Canadian Canola Growers Association).

103 ENVI, *Evidence*, 27 November 2018, 1540 (Susie Miller, Executive Director, Canadian Roundtable for Sustainable Crops).

some soils. Organic producers need tillage to control weeds, so it's not possible for any organic producers. The cost of acquiring the necessary specialized equipment is not necessarily feasible for the smaller operations that you might find in the Maritimes and in parts of Ontario and B.C.”<sup>104</sup> In spite of this, Ms. Miller also mentioned that “[i]t's realistic, however, to expect some continued expansion of no-till and reduced tillage, both of which contribute to soil organic carbon.”<sup>105</sup>

### Improved Nutrient Application

Some witnesses argued that better management of nitrogen fertilizers, which are a driver of nitrous oxide emissions on Canadian farms, could also help reduce GHG emissions and costs for farmers.<sup>106</sup> As Susie Miller explained:

The research has shown that closely monitoring soil nutrient need and adjusting fertilizer type, amount, timing and method can significantly contribute to greenhouse gas reduction. The reason this is so significant is that, in greenhouse gas equivalents, one nitrous oxide kilo is equivalent to 298 carbon. So, when you're talking about greenhouse gas carbon footprint, a small reduction in nitrous oxide emissions can significantly effect [sic] the carbon footprint.<sup>107</sup>

Some witnesses referred to the 4Rs protocol developed by Fertilizer Canada.<sup>108</sup> As Nevin Rosassen of Biological Carbon Canada mentioned, this protocol is “based on using the right amount of fertilizer, at the right rate, in the right place and at the right time.”<sup>109</sup> It can become an especially effective tool to reduce GHG emissions when linked to a carbon offsets protocol, as in Alberta. The province’s Nitrous Oxide Emissions Reduction Protocol (NERP), initiated in 2007, encourages agricultural producers to implement the

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104 Ibid.

105 ENVI, *Evidence*, 27 November 2018, 1545 (Susie Miller, Executive Director, Canadian Roundtable for Sustainable Crops).

106 ENVI, *Evidence*, 27 November 2018, 1535 (Mike Moffatt, Senior Director, Smart Prosperity Institute).

107 ENVI, *Evidence*, 27 November 2018, 1550 (Susie Miller, Executive Director, Canadian Roundtable for Sustainable Crops).

108 ENVI, *Evidence*, 27 November 2018, 1540 (Susie Miller, Executive Director, Canadian Roundtable for Sustainable Crops); ENVI, *Evidence*, 29 November 2018, 1645 (Nevin Rosassen, Chairman, Biological Carbon Canada), ENVI, *Evidence*, 4 December 2018, 1545 (Brian Innes, Vice-President, Public Affairs, Canola Council of Canada).

109 ENVI, *Evidence*, 29 November 2018, 1645 (Nevin Rosassen, Chairman, Biological Carbon Canada).



4R principles on their land to earn carbon offsets through the province’s carbon market.<sup>110</sup>

Robert Coulter, vice-president, First Carbon Credits Corporation, described to the Committee how Alberta’s NERP allowed farmers in the province to earn carbon offsets and increase their yields by adapting their farming methods. As Mr. Coulter described:

[I]n our market-based approach, the coefficient was the money number. The higher your coefficient, the more dollars you generated from your land by aggregating the carbon offsets from it. Soil fertility management, eliminating summer fallow, forage-based rotations, organic amendments and water table management all increased their coefficient, which meant there were more dollars in their pockets. We really tried to show the farmers that it was a win-win. As they incorporated these practices into their farming operations, it would increase their soil organic carbon and they would also have better water retention. We could also show that because of increased yields, they would have a better profit. Not only that, but they could add an additional revenue stream by selling their offsets to the large final emitters in Alberta....<sup>111</sup>

According to Nevin Rosassen, Chairman of Biological Carbon Canada, the NERP creates “huge opportunities to reduce greenhouse gas emissions that are currently accruing through fertilizer use.”<sup>112</sup>

Improved nutrient application is also financially profitable for farmers. As Mike Moffat of Smart Prosperity Institute explained, by using best management practices, farmers could reduce by one third the application of fertilizers, thus reducing their operation costs.<sup>113</sup>

## Recommendation 6

**The Committee recommends that Agriculture and Agri-Food Canada work with provinces, territories, and interested governments to encourage the development of soil nitrous oxide reduction protocols across Canada, building on the carbon offset market model implemented in Alberta.**

To fully appreciate the potential for improved nutrient application, farmers are using precision-guided technologies such as GPS, thanks to which “fertilizer is being placed so precisely, an inch below and to the side of the seam, that the pearl of fertilizer is being

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110 Alberta Agriculture and Forestry, [Nitrous Oxide Reduction Protocol \(NERP\) For Carbon Offsets](#).

111 ENVI, [Evidence](#), 11 December 2018, 1540 (Robert Coulter, Vice-President, First Carbon Credits Corporation).

112 ENVI, [Evidence](#), 29 November 2018, 1645 (Nevin Rosassen, Chairman, Biological Carbon Canada).

113 ENVI, [Evidence](#), 27 November 2018, 1535 (Mike Moffatt, Senior Director, Smart Prosperity Institute).



used to its maximum efficiency.”<sup>114</sup> According to Rick White, Chief Executive Officer of the Canadian Canola Growers Association, GPS technology “cuts costs and emissions associated with fuel use and also cuts fertilizer application.”<sup>115</sup>

Some witnesses have suggested that the Canadian government could play a role in improving nutrient application techniques across Canada. As Nevin Rosassen suggested: “We need funding to develop and refine the evolving science, and carbon markets. To accomplish this, we will also need to update the direct seeding, or conservation cropping protocol, to cover all of the soil zones across all of Canada.”<sup>116</sup>

### Recommendation 7

**The Committee recommends that Agriculture and Agri-Food Canada further support research and development of new agricultural technologies, such as precision-guided nutrient application devices and techniques, including by updating the conservation cropping protocol to cover all soil zones across Canada.**

### Carbon Storage in Soils

Various land management practices, as described above, can enrich and protect agricultural soils, which then retain more carbon and conserve water resources.<sup>117</sup> As Matt Parry from Agriculture and Agri-Food Canada explained, “Canadian producers have adopted technologies and practices that both build resilience to climate change and reduce emissions by improving production efficiency and increasing agricultural soil carbon.”<sup>118</sup>

The Canadian Canola Growers Association is optimistic about the carbon storage capacity of its industry in the years to come:

[C]anola farmers have specifically set a goal to nearly double their carbon sequestration, by a further five million tonnes a year by 2025 [...]. We will meet this goal by maintaining current levels of no[-]till and by investing in plant-breeding innovation and better

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114 ENVI, *Evidence*, 29 November 2018, 1535 (Nevin Rosassen, Chairman, Biological Carbon Canada).

115 ENVI, *Evidence*, 4 December 2018, 1550 (Rick White, Chief Executive Officer, Canadian Canola Growers Association).

116 ENVI, *Evidence*, 29 November 2018, 1645 (Nevin Rosassen, Chairman, Biological Carbon Canada).

117 ENVI, *Evidence*, 22 November 2018, 1725 (Javier Gracia-Garza, Director General, Ontario-Quebec Region, Science and Technology Branch, Department of Agriculture and Agri-Food).

118 ENVI, *Evidence*, 22 November 2018, 1550 (Matt Parry, Director General, Development and Analysis Directorate, Department of Agriculture and Agri-Food).



management practices. Sequestering 16 million tonnes of greenhouse gases would be the equivalent of removing more than 3.4 million cars from the road every year.<sup>119</sup>

Mike Moffat from the Smart Prosperity Institute pointed out that “[e]nhanced carbon sequestration will also play a role in reducing the sector's carbon footprint.”<sup>120</sup>

Nonetheless, Mr. Moffatt expressed some concerns over the issues of measurement and permanence, stating that, “making sure the carbon that goes in the ground is actually staying in the ground”<sup>121</sup> remains a challenge. He also argued that it would be complex to create a carbon offsets market for carbon sequestration in agricultural soils for this very reason.

Ron Bonnett of the Canadian Federation of Agriculture suggested that Agriculture and Agri-Food Canada should better publicize programs available to help farmers improve carbon management in agricultural soils, and that they should increase funding as necessary. Mr. Bonnett also believes the federal government should incentivize conservation. He gave the example of the alternative land use services program (ALUS), a non-profit, community-based program coordinated by ALUS Canada “that offers per acre annual payments to farmers engaged in conserving carbon sinks, such as wetlands and forest stands.”<sup>122</sup> Witnesses stated that encouraging farmers to increase carbon storage in agricultural soils, and developing capacity, could have a significant impact on Canada’s climate targets. For instance, Dr. Susan Wood-Bohm referred to a program initiated in France called “4 per 1000”, which aims to increase carbon in agricultural soils and asserts that if agricultural soils could sequester an additional 0.4% of carbon each year, France would have no further need to address other GHG emissions reduction strategies.<sup>123</sup> To increase carbon sequestration on farms:

## **Recommendation 8**

**The Committee recommends that Agriculture and Agri-Food Canada ensure Canadian farmers are well informed about existing programs that could help them transition to low-carbon farming activities.**

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119 ENVI, [Evidence](#), 4 December 2018, 1550 (Rick White, Chief Executive Officer, Canadian Canola Growers Association).

120 ENVI, [Evidence](#), 27 November 2018, 1535 (Mike Moffatt, Senior Director, Smart Prosperity Institute).

121 Ibid.

122 ENVI, [Evidence](#), 4 December 2018, 1605 (Ron Bonnett, President, Canadian Federation of Agriculture).

123 ENVI, [Evidence](#), 6 December 2018, 1720 (Susan Wood-Bohm, As an individual).

The Committee also heard about the potential of wetlands to store carbon. Ms. MacNeil of Natural Resources Canada noted that there can be “serious consequences for climate change” when wetlands are drained, thereby releasing the GHGs that they stored.<sup>124</sup> Mr. Larocque of the Forest Products Association of Canada informed the Committee of ongoing collaborative work between the forest sector, academics, government, and conservation groups such as Ducks Unlimited Canada to quantify the carbon stored in wetlands and peatlands and to conserve these areas. He noted that more research is needed to quantify the significant amounts of carbon that these areas can store. The Canadian Federation of Agriculture recommended “that the federal government work with existing organizations such as the Canadian Wetlands Roundtable to evaluate the carbon capture potential of conservation efforts in the Canadian agriculture, forestry and other natural resource sectors.”<sup>125</sup>

### **Recommendation 9**

**The Committee recommends that Environment and Climate Change Canada, Natural Resources Canada, and Agriculture and Agri-Food Canada work together and with partners, including the Canadian Wetlands Roundtable, to support research and conservation in order to maximize the carbon storage potential of wetlands.**

### **Improved Livestock Management and Genomics**

Some witnesses described how livestock management could be improved to reduce emissions of GHGs, especially methane.<sup>126</sup> The conversation focused on changes in animal diets and how to make ruminants’ digestion process (enteric fermentation) less methane intensive.

Javier Gracia-Garza, Director General, Ontario-Quebec Region, Science and Technology Branch at Agriculture and Agri-Food Canada, described that ongoing research at that department explores how “microbial communities in the ruminants, as well as the foods they are being fed” alter the production of methane.<sup>127</sup>

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124 ENVI, *Evidence*, 22 November 2018, 1725 (Beth MacNeil, Assistant Deputy Minister, Canadian Forest Service, Department of Natural Resources).

125 ENVI, *Evidence*, 4 December 2018, 1605 (Ron Bonnett, President, Canadian Federation of Agriculture).

126 Agriculture and Agri-Food Canada, *Greenhouse gases*.

127 ENVI, *Evidence*, 22 November 2018, 1550 (Javier Gracia-Garza, Director General, Ontario-Quebec Region, Science and Technology Branch, Department of Agriculture and Agri-Food).



Innovative methods, like feeding certain seaweed to cows, may have an impact on ruminants' methane emissions, but based on preliminary research by the Smart Prosperity Institute, the biggest reduction in GHG emissions from livestock could come from genomics improvements. As Mike Moffatt discussed, “[t]he biggest gain that we've seen—we're very preliminary in our research—has to be more on the genomic side, basically just technologies to breed cows to emit less. That seems to be where the gains would be, rather than in small changes in feed, but every little bit helps.”<sup>128</sup>

The Committee was interested in how following an increasingly plant-based diet could reduce total GHG emissions originating from livestock. The Committee asked Agriculture and Agri-Food Canada (AAFC) officials about quantitative research into the GHG impacts of choosing plant-based protein sources over animal-based protein sources. AAFC's written response to this inquiry explained that the department does not conduct research on the impacts of different diets on Canada's GHG emissions. However, AAFC noted that Canadian livestock producers have “lowered their GHG emissions per kilogram of beef by 15 percent over the past 30 years, making the carbon footprint of Canadian beef one of the smallest in the world.”<sup>129</sup> The Committee did not hear from further witnesses on the emissions impact of plant-based protein options.

### **Recommendation 10**

**The Committee recommends that Agriculture and Agri-Food Canada continue funding research and development on how improvements to animal diets, farming practices, and genomics could reduce methane emissions from livestock.**

### **Barriers to Technology Adoption**

The costs associated with the adoption of agricultural technologies, such as precision-guided nutrient application, may be prohibitive for small and medium-size farms, as well

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128 ENVI, *Evidence*, 27 November 2018, 1550 (Mike Moffatt, Senior Director, Smart Prosperity Institute).

129 Written response from Sophie Bedard, Director, Parliamentary Relations and Portfolio Coordination, Agriculture and Agri-Food Canada to Mr. John Aldag, M.P., Chair, Standing Committee on Environment and Sustainable Development, 2019.

as for potential early adopters.<sup>130</sup> According to Kristin Baldwin, Director, Stakeholder Relations, Agricultural Institute of Canada,

Key government support and incentives from the research stage to the adoption by the end-user are essential to broadening the use of these technologies. Creating a favourable climate for the adoption of clean technologies will help ensure that the desired effects are felt on a broader scale. This could be done through the taxation system such as with tax breaks, writeoffs or direct financial support.<sup>131</sup>

Another important issue witnesses believed may hinder technology adoption and farmers' ability to learn about innovative farming techniques is the lack of broadband connectivity in rural areas. In the case of precision agriculture, some witnesses noted that many devices need high-speed Internet to function. The lack of technology adoption, as they explained, may be linked to a lack of access to broadband connectivity and problems of Internet bottlenecks in rural areas.<sup>132</sup> Lack of access to broadband connection also creates a knowledge gap for farmers as access to new information increasingly depends on Internet access. As Susie Miller emphasised, "if they [the farmers] don't have access to online courses because their Internet is too slow or it's out, they don't have the same advantages of adopting new practices and appropriate practices."<sup>133</sup>

The Committee notes that, in 2016, the Canadian Radio-television and Telecommunications Commission deemed access to broadband Internet in rural areas a basic service.<sup>134</sup> Furthermore, the House of Commons Standing Committee on Industry, Science and Technology conducted a study on broadband connectivity in rural Canada from November 2017 to March 2018. The report resulting from this study stated that a

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130 ENVI, [Evidence](#), 11 December 2018, 1550 (Kristin Baldwin, Director, Stakeholder Relations, Agricultural Institute of Canada); ENVI, [Evidence](#), 27 November 2018, 1550 (Mike Moffatt, Senior Director, Smart Prosperity Institute).

131 ENVI, [Evidence](#), 11 December 2018, 1550 (Kristin Baldwin, Director, Stakeholder Relations, Agricultural Institute of Canada).

132 ENVI, [Evidence](#), 27 November 2018, 1600 (Mike Moffatt, Senior Director, Smart Prosperity Institute); ENVI, [Evidence](#), 11 December 2018, 1550 (Kristin Baldwin, Director, Stakeholder Relations, Agricultural Institute of Canada).

133 ENVI, [Evidence](#), 27 November 2018, 1605 (Susie Miller, Executive Director, Canadian Roundtable for Sustainable Crops).

134 Canadian Radio-television and Telecommunications Commission, [Telecom Regulatory Policy CRTC 2016-496](#), 21 December 2016.



“digital divide” remains between Canada’s urban and rural regions, and recommended various solutions to bridge this gap.<sup>135</sup>

In the fall of 2018, the Auditor General of Canada published a report on Internet connectivity in rural and remote areas of Canada<sup>136</sup> that, according to Kristin Baldwin, “painted a disappointing picture of the state of Canada's connectivity in rural and remote areas.”<sup>137</sup> However, Ms. Baldwin also mentioned to the Committee that “[t]he federal government has taken some action on this, including setting up the federal-provincial-territorial connectivity Committee and launching a public consultation on the topic.”<sup>138</sup> She encourages “the government to move forward expediently and shift from the consultation stage to the implementation stage.”<sup>139</sup> In order to facilitate the use of new agricultural technologies to reduce GHG emissions:

#### **Recommendation 11**

**The Committee recommends that the Government of Canada continue to work with provincial, territorial and interested governments to ensure reliable broadband Internet access in rural and remote areas.**

Finally, five witnesses explicitly recognized that the government’s accelerated capital costs allowance presented in the 2018 *Fall Economic Statement* was encouraging.<sup>140</sup> The CEO of Canadian Canola Growers Association, Rick White, believes this measure “will spur innovation and investment in innovation.”<sup>141</sup>

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135 House of Commons, Standing Committee on Industry, Science and Technology, *Broadband Connectivity in Rural Canada: Overcoming the Digital Divide*, Eleventh Report, 1<sup>st</sup> Session, 42<sup>nd</sup> Parliament, April 2018.

136 Office of the Auditor General of Canada, “*Report 1—Connectivity in Rural and Remote Areas*,” Fall 2018.

137 ENVI, *Evidence*, 11 December 2018, 1550 (Kristin Baldwin, Director, Stakeholder Relations, Agricultural Institute of Canada).

138 Ibid.

139 Ibid.

140 ENVI, *Evidence*, 27 November 2018, 1610 (Mike Moffatt, Senior Director, Smart Prosperity Institute); ENVI, *Evidence*, 4 December 2018, 1625 (Ron Bonnett, President, Canadian Federation of Agriculture); ENVI, *Evidence*, 11 December 2018, 1610 (Doug Hooper, Director, Policy and Regulations, Advanced Biofuels Canada); ENVI, *Evidence*, 4 December 2018, 1630 (Rick White, Chief Executive Officer, Canadian Canola Growers Association); ENVI, *Evidence*, 29 November 2018, 1630 (Robert Larocque, Senior Vice-President, Forest Products Association of Canada).

141 ENVI, *Evidence*, 4 December 2018, 1630 (Rick White, Chief Executive Officer, Canadian Canola Growers Association).

## Recommendation 12

**The Committee recommends that the Government of Canada find further incentives and instruments to support access to innovative agricultural technologies by Canadian farmers.**

### Bioenergy and Bioproducts from Agriculture

Bioenergy and bioproducts from agriculture play an important role in Canada's GHG emissions reduction strategy. Bioenergy currently accounts for 6% of Canada's energy supply.<sup>142</sup> Agriculture and Agri-Food Canada notes that global biofuel production currently comes primarily from conventional ethanol, derived from food crops such as corn and sugar cane, and from biodiesel made from fats, waste greases, and vegetable oils. However, advanced biofuels and their co-products, made from biomass obtained from wood, municipal and agricultural waste, and crop residues, are reaching the production and commercial deployment stages in a number of countries, including Canada.<sup>143</sup>

Canada's Renewable Fuels Strategy was announced by the federal government in 2006 and, in 2010, the *Renewable Fuels Regulations* under the *Canadian Environmental Protection Act, 1999* came into effect.<sup>144</sup> These regulations require fuel producers and importers to have an average renewable content (i.e., biofuels) of at least 5% of the volume of gasoline that they produce or import, and at least 2% of the volume of diesel fuel that they produce or import.<sup>145</sup> In addition to reducing GHG emissions from fuel use, Canada's Renewable Fuels Strategy is designed to be "providing new market opportunities for agricultural producers and rural communities; supporting the growth of a domestic biofuels industry; and accelerating the commercialization of new biofuel technologies."<sup>146</sup> In the *Pan-Canadian Framework on Clean Growth and Climate Change*, the federal government advocates for the use of agricultural biomass to produce bioenergy and advanced biofuels, or to create other bioproducts.<sup>147</sup>

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142 Natural Resources Canada, *Renewable energy facts*.

143 Agriculture and Agri-Food Canada, *Bioproducts*.

144 Ibid.

145 Natural Resources Canada, *Renewable Energy Facts*.

146 Agriculture and Agri-Food Canada, *Bioproducts*.

147 Environment and Climate Change Canada, "Forestry, agriculture, and waste", in *Federal Actions for a Clean Growth Economy. Delivering on the Pan-Canadian Framework on Clean Growth and Climate Change*, 2016.



Some witnesses mentioned the importance of federal renewable fuels regulations and complementary provincial regulations (such as Alberta’s Renewable Fuels Standard and British Columbia’s Low Carbon Fuel Standard) to incentivize the use of biofuels in Canada.<sup>148</sup> Doug Hooper, Director at Advanced Biofuels Canada, explained to the Committee that “refineries to produce low-carbon, advanced biofuels, such as biodiesel made from canola, soybean oil and animal fats, and cellulosic ethanol made from biomass and municipal wastes, were built in Canada to meet demand for clean fuels”<sup>149</sup> over the last decade as a result of such policies.

Mr. Hooper also described the positive impacts such policies had in terms of GHG emissions reduction over the last few years:

From 2010 to 2016, biodiesel and renewable diesel use has grown from 160 million litres per year to 540 million litres. Over the same period, ethanol use expanded from 1.7 billion litres to 2.8 billion litres. Annual greenhouse gas reductions from the elimination of fossil fuels used in cars and trucks has gone from 1.8 million tonnes in 2010 to 4.1 million tonnes in 2016. These are remarkable achievements in a short period.<sup>150</sup>

As part of the Pan-Canadian Framework, the Government of Canada is currently developing a Clean Fuel Standard with the goal of reducing Canada’s GHG emissions by 30 megatonnes by 2030.<sup>151</sup> Some witnesses have suggested that the agriculture sector could contribute significantly to this target.

Rick White, CEO of the Canadian Canola Growers Association told the Committee that the canola industry has contributed to the production of biofuels in Canada in the past and could contribute even more so in the future. As he pointed out:

Canola represents roughly 40% of the feedstock to biofuel in Canada, which is using about 500,000 tonnes of canola seed. The new CFS [Clean Fuel Standard] could drive demand for Canadian input such as canola. Canola biodiesel emits up to 90% less greenhouse gas than diesel from fossil fuels. It is proven. It’s ready and it’s available. If the mandate for biofuels was increased to 5% of the diesel fuel, Canadian canola production could easily fill this demand using 1.3 million metric tons of canola. [...] With

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148 ENVI, [Evidence](#), 27 November 2018, 1625 (Susie Miller, Executive Director, Canadian Roundtable for Sustainable Crops).

149 ENVI, [Evidence](#), 11 December 2018, 1555 (Doug Hooper, Director, Policy and Regulations, Advanced Biofuels Canada).

150 Ibid.

151 Environment and Climate Change Canada, [Clean Fuel Standard](#).



a 5% mandate, based on current blend levels, canola would contribute reductions of 1.8 million tonnes of carbon dioxide equivalents annually.<sup>152</sup>

Ron Bonnett, President, Canadian Federation of Agriculture sees great opportunities in agriculture for bioenergy and bioproducts:

With respect to bioenergy and bioproducts, there is immense potential in these fields in looking at how you can commercialize those operations. Agricultural waste and purpose-grown feedstock can significantly reduce the carbon footprint of many products when it replaces oil and gas feedstock. This goes above and beyond fuels to include composites, fibre, specialty chemicals and sugars.<sup>153</sup>

It was noted, however, that “Canada has fallen short of its goal to meet our biofuels demand with Canadian-made biofuels.”<sup>154</sup> As a result of this trade deficit, Mr. Hooper explained to the Committee that Canada has imported ethanol and biodiesel from the United States and Asia over the last few years. However, Advanced Biofuels Canada is expecting that “44 new advanced biofuels production projects and eight facility expansion projects”<sup>155</sup> will be achieved in Canada by 2030. These projects represent more than \$6 billion in capital investments and the “utilization of up to 2.1 million tonnes per year of vegetable oils and animal fats, and up to 3.5 million tonnes per year of forestry and agricultural biomass residues and wastes.”<sup>156</sup> This, as Doug Hooper highlighted, “significantly reduces our dependence on export markets and adds value to our natural resources.”<sup>157</sup>

### Recommendation 13

**The Committee recommends that the Government of Canada develop a bioenergy strategy to 1) identify the production needs at the farm level; 2) fund the research and development needed to grow the appropriate crops; 3) assess the investment and market potentials of the different products that could be produced and; 4) increase the renewable content in fuels.**

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152 ENVI, *Evidence*, 4 December 2018, 1555 (Rick White, Chief Executive Officer, Canadian Canola Growers Association).

153 ENVI, *Evidence*, 4 December 2018, 1600 (Ron Bonnett, President, Canadian Federation of Agriculture).

154 ENVI, *Evidence*, 11 December 2018, 1555 (Doug Hooper, Director, Policy and Regulations, Advanced Biofuels Canada).

155 Ibid.

156 Ibid.

157 Ibid.



## Carbon Pricing

The Committee heard further testimony regarding carbon pricing incentivizing GHG emissions reduction in the agriculture sector. Mr. Nevin Rosaasen represented Biological Carbon Canada, an organization which facilitates the selling of carbon credits from forests, farms and ranches, and explained the financial opportunity of a carbon market for farmers. He specified that, since the Government of Alberta created North America's first compliance carbon price regulation and offset program in 2007, carbon offsets of 14.7 million tonnes of CO<sub>2</sub> equivalents had been created, serialized, and sold.<sup>158</sup>

Carbon pricing was discussed in comparison to policy alternatives to reduce GHG emissions, including regulations and incentives. Based on his experience, Mr. Rosaasen noted that “price signals work” as “all industries will improve their efficiencies to reduce their overall costs”.<sup>159</sup> Mr. Rick White observed, “You can use either the carrot which are incentives, or the stick which is the tax. At the end of the day, we're looking at what behaviour needs to be changed here.”<sup>160</sup> When asked about the use of regulations to limit GHG emissions, Dr. Mike Moffatt of the Smart Prosperity Institute commented:

The risk that governments run in using those instruments is that they're picking winners and losers, in many ways, by setting those performance standards or those technology standards. It's essentially, “You do this; you don't do this”. In some sense, it's almost taking a “government knows best” approach. Ideally you would want to let the market figure out where it's cheapest to cut those emissions. So yes, I would say in many instances—in most instances—the best bang for the buck is going to be through carbon pricing. That is not to suggest it's appropriate in all cases, again, because there are going to be exceptions depending on the industry and depending on the nature of those emissions.<sup>161</sup>

Dr. Moffatt supports the use of carbon pricing but notes that, in order to reduce greenhouse gas emissions through agriculture, “carbon pricing only takes you so far.”<sup>162</sup> He explained that agriculture produces non-point source<sup>163</sup> emissions which can be difficult to measure for carbon pricing. He also observed that agriculture's low profit

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158 ENVI, [Evidence](#), 29 November 2018, 1535 (Nevin Rosassen, Chairman, Biological Carbon Canada).

159 ENVI, [Evidence](#), 29 November 2018, 1650 (Nevin Rosassen, Chairman, Biological Carbon Canada).

160 ENVI, [Evidence](#), 4 December 2018, 1640 (Rick White, Chief Executive Officer, Canadian Canola Growers Association).

161 ENVI, [Evidence](#), 27 November 2018, 1625 (Mike Moffatt, Senior Director, Smart Prosperity Institute).

162 ENVI, [Evidence](#), 27 November 2018, 1620 (Mike Moffatt, Senior Director, Smart Prosperity Institute).

163 Point source pollution comes from a single identifiable source, such as the end of a discharge pipe. In contrast, non-point sources of pollution do not arise from a single identifiable point, but instead are released more diffusely over a larger area, such as runoff from farmland or off gassing.

margin makes it susceptible to international competition with potential “carbon leakage”. Finally, he noted that innovation in agriculture is very important so government support for pilot projects or for farmers purchasing new technologies could be useful to reduce GHGs.<sup>164</sup> Dr. Moffatt recommended that carbon pricing be one of a suite of policies implemented to reduce GHGs from agriculture.<sup>165</sup>

Some witnesses expressed support for carbon pricing as long as the concerns of agriculture are reflected in its implementation. Mr. Don McCabe of Biological Carbon Canada accepts that there has to be a price on carbon, but cautions that a “carbon tax” can be harmful to natural resource industries. Instead, Mr. McCabe recommends a cap and trade pricing system that “has to be fully operational with the trade portion” in order to realize revenue opportunities in agriculture and forestry.<sup>166</sup> Mr. Ron Bonnett, President of the Canadian Federation of Agriculture, wants to ensure that a carbon price doesn’t put agriculture “in a noncompetitive position”. Regarding the Government of Canada’s exemptions to the fuel charge for farm fuels, he commented, “We’re pleased to see the exemptions that were granted. However, they didn’t quite cover all of agriculture.”<sup>167</sup> When speaking about canola processing, Mr. Brian Innes of the Canola Council of Canada added:

For Canada to have a significant processing sector, we must remain a competitive place to invest and to operate facilities. Otherwise, our processing plants will go to other countries and we will ship our raw product and our jobs to somewhere else. The output-based pricing system is very positive, but it needs to be designed carefully so that a trade-exposed sector like ours, which exports 90% of what it produces, remains competitive.<sup>168</sup>

Ms. Kristin Baldwin of the Agricultural Institute of Canada expressed her sector’s support for carbon pricing but sought “further leadership from the federal government as it related to the use of carbon tax revenue.”<sup>169</sup> In her view:

Recognizing the significant impact of clean technology in the agricultural sector and the environment as a whole, we recommend that a portion of these revenues be specifically earmarked for the introduction of new sources of energy as well as to support the

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164 ENVI, *Evidence*, 27 November 2018, 1620 (Mike Moffatt, Senior Director, Smart Prosperity Institute).

165 Ibid.

166 ENVI, *Evidence*, 29 November 2018, 1650 (Don McCabe, Director, Biological Carbon Canada).

167 ENVI, *Evidence*, 4 December 2018, 1655 (Ron Bonnett, President, Canadian Federation of Agriculture).

168 ENVI, *Evidence*, 4 December 2018, 1545 (Brian Innes, Vice-President, Public Affairs, Canola Council of Canada).

169 ENVI, *Evidence*, 11 December 2018, 1555 (Kristin Baldwin, Director, Stakeholder Relations, Agricultural Institute of Canada).



production of biofuels. Through dedicated earmarked funding, this sector will get the support it needs to grow...

The need for clarity and certainty regarding carbon policy was expressed by some witnesses. Mr. McCabe stated that “we need to have clear signals in policy, and that means a price on carbon.”<sup>170</sup> Mr. Doug Hooper of Advanced Biofuels Canada explained:

The political risk that is associated with policy reversal, policy delay or policy implementation cannot be underestimated... The debate over a carbon tax on both sides is stalling investment decisions, because capital projects are hundreds of millions of dollars and you can't deploy capital in a dynamic risk environment. It needs to be resolved.<sup>171</sup>

## Waste

### Organic Waste

One of the greatest GHG concerns related to waste is the methane generated from degrading organic waste in landfills. Mr. Vincent Ngan of Environment and Climate Change Canada informed the Committee that methane generated from organic waste in landfills has increased since 2005 (from 970 kilotonnes to 1,027 kilotonnes), which can be attributed to population growth.<sup>172</sup> However, he noted that this rise has “been offset by an increase in the capture of methane in municipal landfills, from 32% to a total of 44% in 2016,” which he attributed to provincial regulatory requirements for carbon capture at major landfills.<sup>173</sup> Environment and Climate Change Canada’s research found that landfill gas capture systems are in place or under development at 94 out of the 130 largest landfills in Canada, and also at 23 of the 149 medium-sized landfills.<sup>174</sup>

Mike Moffatt, Senior Director, Smart Prosperity Institute, stated that the best way to reduce GHGs from household waste is to keep organic materials out of landfills, such as through the use of curbside green bin programs.<sup>175</sup> Mr. Karel Ménard, Executive Director, Front commun québécois pour une gestion écologique des déchets, concurred that it is

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170 ENVI, *Evidence*, 29 November 2018, 1720 (Don McCabe, Director, Biological Carbon Canada).

171 ENVI, *Evidence*, 11 December 2018, 1655 (Doug Hooper, Director, Policy and Regulations, Advanced Biofuels Canada).

172 ENVI, *Evidence*, 22 November 2018, 1555 (Vincent Ngan, Director General, Horizontal Policy, Engagement and Coordination, Department of the Environment).

173 Ibid.

174 Ibid.

175 ENVI, *Evidence*, 27 November 2018, 1635 (Mike Moffatt, Senior Director, Smart Prosperity Institute).

imperative to divert organic matter from landfills in order to prevent the production of methane.<sup>176</sup> Mr. Ngan noted that the diversion of organics from landfills is one area that can be supported by the \$2-billion federal Low-Carbon Economy Fund, which funds programs in the provinces and territories.<sup>177</sup> The Committee recognizes leadership such as the *Québec Residual Materials Management Policy*<sup>178</sup> in banning the landfill disposal of organic material. In order to reduce the release of methane from landfills to the atmosphere:

### Observation 5

**The Committee encourages provinces, territories, and interested governments to increasingly require the use of landfill gas capture systems and the diversion of organics from landfills.**

### Non-Organic Waste

Mr. Karel Ménard of Front commun québécois pour une gestion écologique des déchets expressed the importance of considering the whole picture of environmental impacts (life-cycle analysis) of products and their alternatives, to avoid being misled when environmental impacts are simply shifted to another stage in a product's life cycle.<sup>179</sup> Mr. Ménard cautioned that some recyclable goods still result in substantial GHG emissions and pointed out that just because a product is recyclable does not mean that it will be recycled.<sup>180</sup> Rather than just focusing on recycling, Mr. Menard reminded the Committee of the importance of the other Rs in the 3 Rs: reduce and reuse. He emphasized the importance of reducing waste at the source by reducing the consumption of disposable products. He also promoted reuse programs such as beer bottle return programs in order to avoid some GHG emissions.<sup>181</sup>

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176 ENVI, *Evidence*, 6 December 2018, 1605 (Karel Ménard, Executive Director, Front commun québécois pour une gestion écologique des déchets).

177 ENVI, *Evidence*, 22 November 2018, 1710 (Vincent Ngan, Director General, Horizontal Policy, Engagement and Coordination, Department of the Environment).

178 Éditeur officiel du Québec, *Québec residual materials management policy*, chapter Q-2, r. 35.1, Environment Quality Act, chapter Q-2, s. 53.4, 12 September 2018.

179 ENVI, *Evidence*, 6 December 2018, 1600 (Karel Ménard, Executive Director, Front commun québécois pour une gestion écologique des déchets).

180 Ibid.

181 ENVI, *Evidence*, 6 December 2018, 1610 (Karel Ménard, Executive Director, Front commun québécois pour une gestion écologique des déchets).



The Front commun québécois pour une gestion écologique des déchets believes in extended producer responsibility – that manufacturers should be responsible to recover goods at the end of their life and process them with the least possible impact. Consumer goods that include a proportion of recycled material could encourage a market for recovered content. Mr. Ménard observed that extended producer responsibility could reduce disposal costs for municipalities and may help producers understand the full cost of disposable products.<sup>182</sup>

Mr. Ménard called on the government to encourage recycling and minimum recyclable content for products through regulations and incentives. He also called on the government to lead by example by rethinking the use of single-use products and recyclable versus reusable products. In order to lead by example:

#### **Recommendation 14**

**The Committee recommends that the Government of Canada continue to work to eliminate the use of single-use disposable products in its procurement and operations.**

In support of waste reduction to minimize GHG emissions:

#### **Observation 6**

**The Committee encourages consumers, industry, provinces, territories, and interested governments to reduce their use of single-use disposable products.**

Ms. Carolyn Butts, Co-Owner, Bon Eco Design, discussed her experience diverting waste from landfills as part of her design business using repurposed materials. Ms. Butts advocates for “closing the loop on our consumption” and moving to a circular or “cradle to cradle” system whereby products and materials are designed to be recoverable and reusable or recyclable at the end of their lifetimes. She observed that waste products that are currently recycled, such as plastic bottles, are typically made into products of lower value than the original product (“downcycled”). She believes that the design of the original product should consider how to add value to that product when it’s recycled, perhaps giving the recycled material novel properties so that it is marketable, valuable, and desirable. She notes that this is an innovation challenge that requires research involving science, technology, engineering, and art and design.

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182 ENVI, *Evidence*, 6 December 2018, 1720 (Karel Ménard, Executive Director, Front commun québécois pour une gestion écologique des déchets).

In Ms. Butts' opinion, there are unrealized economic opportunities in the "new waste economy", including the collection, sorting, selling, and design and manufacturing of recovered materials. However, she noted that access to waste streams, which are currently landfilled, would be needed to realize these economic opportunities.<sup>183</sup> Ms. Butts has found that landfilling is an "extremely lucrative business" and that it is essentially a trucking operation. In her opinion, landfilling and burning are unsustainable solutions to our waste and "are loaded with carbon emissions."<sup>184</sup> She believes that the waste sector is overdue for research and innovation.

There was discussion among committee members of the opportunity of diverting materials from landfill through increased public access to recycling depots, re-use centres, and online inventories of available residues. Ms. Butts noted that funding for research into such possibilities is needed as a starting point. Furthermore, Mr. Ménard of the Front commun québécois pour une gestion écologique des déchets expressed a need for improved communication between provinces and territories to share their challenges, successes, and lessons learned.<sup>185</sup>

### **Recommendation 15**

**The Committee recommends that Environment and Climate Change Canada work with provinces, territories, interested governments, and other partners to identify opportunities for federal support of waste management research, such as the development of a harmonized national waste reduction and reuse strategy.**

To divert hard-to-recycle single-use plastics from landfill, Mr. W. Scott Thurlow, Senior Advisor, Government Affairs, Dow Chemical Canada Inc., explained Dow's Hefty EnergyBag program to the Committee. The EnergyBag program involves curbside collection of hard-to-recycle plastics (e.g. chip bags, plastic wrap, straws, and foam food containers) in distinctive bags by existing recycling haulers.<sup>186</sup> Bags are diverted unopened from community waste facilities, the contents are sorted, and chemical conversion technologies, such as pyrolysis, are used to convert the plastics into diesels, oils, and waxes.<sup>187</sup> Such conversion technologies for energy recovery from plastics are

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183 ENVI, *Evidence*, 29 November 2018, 1555 (Carolyn Butts, Co-Owner, Bon Eco Design).

184 ENVI, *Evidence*, 29 November 2018, 1545 (Carolyn Butts, Co-Owner, Bon Eco Design).

185 ENVI, *Evidence*, 6 December 2018, 1720 (Karel Ménard, Executive Director, Front commun québécois pour une gestion écologique des déchets).

186 ENVI, *Evidence*, 6 December 2018, 1615 (W. Scott Thurlow, Senior Advisor, Government Affairs, Dow Chemical Canada Inc.).

187 Ibid.



currently seen as a disposal option, but Mr. Thurlow would like them to be recognized as acceptable diversion options.<sup>188</sup> The EnergyBag program is currently in use in 13 American communities and Mr. Thurlow indicated that Dow is exploring opportunities for a Canadian pilot program in 2019.<sup>189</sup> Mr. Thurlow is of the opinion that the Hefty EnergyBag should be part of Canada’s waste management solution to address the hard-to-recycle plastics which currently end up in landfill.<sup>190</sup>

Beyond the EnergyBag program, Mr. Thurlow stated that Dow Canada sees a need for a more nationally-harmonized waste management system across Canada that is clearer and better understood by consumers.<sup>191</sup> He believes that this could increase recycling rates, reduce recycling costs through the economies of scale, improve the quality of recycling stock, and ultimately decrease GHG emissions from waste. Such national consistency in recycling standards could facilitate innovation among national brands to minimize the non-recyclable content in their products that is destined for landfill. In the style of National Model Codes, to facilitate recycling and improve its outcomes:

#### **Recommendation 16**

**The Committee recommends that Environment and Climate Change Canada collaborate with provinces, territories, interested governments, industry, and other stakeholders to develop an aspirational harmonized national model recycling system that could be adopted and/or adapted by jurisdictions responsible for waste management.**

## **CONCLUSION**

Throughout this study, the Committee heard about existing and potential solutions to reduce GHG emissions in the forestry, agriculture and waste sectors. In each of these areas, opportunities exist to further reduce Canada’s emissions. Adopting best management practices and technologies can make a difference, by: increasing agricultural outputs per acre of land; helping to reduce and reuse forestry residues; capturing more carbon emissions in trees, wood products and agricultural soils; and helping reduce the amount of material sent to landfill, to name a few. Innovation is also

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188 ENVI, *Evidence*, 6 December 2018, 1620 (W. Scott Thurlow, Senior Advisor, Government Affairs, Dow Chemical Canada Inc.).

189 ENVI, *Evidence*, 6 December 2018, 1615 (W. Scott Thurlow, Senior Advisor, Government Affairs, Dow Chemical Canada Inc.).

190 Ibid.

191 ENVI, *Evidence*, 6 December 2018, 1620 (W. Scott Thurlow, Senior Advisor, Government Affairs, Dow Chemical Canada Inc.).



important. Many witnesses recommended that the Government of Canada continue to fund research to unlock the full potential of the forestry, agriculture, and waste sectors to decrease GHGs.

Federal efforts to reduce GHG emissions in the forestry, agriculture and waste sectors must be in support of, and in collaboration with, provinces, territories and interested governments. The Committee appreciates that action must be taken now to further accelerate emissions reductions. As Dr. Susan Wood-Bohm recommended to the Committee, “Given the huge urgency to address greenhouse gas emission reduction goals, it is important not to let perfection be the enemy of the good.”<sup>192</sup>

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192 ENVI, *Evidence*, 6 December 2018, 1600 (Susan Wood-Bohm, As an individual).



# APPENDIX A: PAN-CANADIAN FRAMEWORK ON CLEAN GROWTH AND CLIMATE CHANGE— SECTION 3.5: FORESTRY, AGRICULTURE AND WASTE\*

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## Forestry, agriculture, and waste

Emissions from agriculture (livestock and crop production) and extraction of forestry resources accounted for about 10 percent of Canada’s emissions in 2014, and they are not projected to significantly change by 2030. Municipal waste accounts for a small portion (about 3 percent) of Canada’s total GHGs, and these emissions are projected to decline, largely due to increases in landfill gas capture.

Agricultural soils and forests also absorb and store carbon. The emissions or removals from carbon sinks can fluctuate with natural disturbances (e.g. forest fires), but there are still a number of actions that can increase carbon storage and reduce emissions.

Forests, wetlands, and agricultural lands across Canada will play an important natural role in a low-carbon economy by absorbing and storing atmospheric carbon. Actions taken by jurisdictions and woodlot owners to accelerate reforestation, to continuously improve sustainable management practices, and to plant new forests where they do not currently exist will enhance stored carbon. Clean technology, such as lower-carbon bioenergy, and bioproducts that use feedstock from agriculture and forestry waste and dedicated crops to replace higher-carbon fuels can also reduce emissions. Continued innovation and clean technology in agriculture will build on past GHG reduction successes of decreasing emissions per unit of production. The municipal waste sector will also be a key source of cleaner fuels such as renewable natural gas from landfills.

The approach to these sectors will include (1) enhancing carbon storage in forests and agricultural lands; (2) supporting the increased use of wood for construction; (3) generating fuel from bioenergy and bioproducts; and, (4) advancing innovation.

Forests, wetlands, and agricultural lands can be enhanced as “carbon sinks” through actions such as planting more trees, improving forest carbon management practices,

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\* Environment and Climate Change Canada, *Pan-Canadian Framework On Clean Growth And Climate Change: Canada’s Plan To Address Climate Change And Grow The Economy*, 2016, pp. 22–23.

minimizing losses from fires and invasive species, restoring forests that have been affected by natural disturbances, and increasing adoption of land management practices like increasing perennial and permanent cover crops and zero-till farming. Protecting and restoring natural areas, including wetlands, can also benefit biodiversity and maintain or enhance carbon storage.

Increasing the use of wood for construction can reduce emissions as the carbon stored in that wood gets locked in for a long period of time. Increasing domestic demand for Canadian wood products will also support the vibrant forest industries across Canada, which have a long history of innovating to develop new products and more efficient and sustainable forest practices.

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.

The forestry, agriculture, and waste sectors also provide biomass for bioproducts that can be used in place of fossil fuels in other sectors. For example, waste products from forestry, agriculture, and landfills can be converted into energy sources such as renewable natural gas. Dedicated crops can be grown as feedstocks for products like bioplastics. Expanding renewable fuel industries represents an opportunity to create new jobs and economic growth across Canada.

**Biomass-fired district heating: Prince Edward Island** is home to Canada's longest running, biomass-fired district heating system. Operating since the 1980's, the system has expanded to serve over 125 buildings in the downtown core of Charlottetown, including the University of Prince Edward Island and the Queen Elizabeth Hospital, and cleanly burns 66 000 tons of waste materials annually.

Innovative solutions, including clean technologies, are required to reduce emissions from agriculture. Promising new technologies are being developed to reduce emissions from livestock and crop production, including from the use of precision farming and "smart" fertilizers, which time the release to match plant needs, and from feed innovations that reduce methane production in cattle. Actions pertaining to the agriculture sector will be developed collaboratively through Canada's Next Agriculture Policy Framework.

These actions in the forestry, agriculture, and waste sectors, and supporting clean technology businesses, can help to create jobs and build more sustainable communities.

## **NEW ACTIONS**

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### **1. Increasing stored carbon**

Federal, provincial, and territorial governments will work together to protect and enhance carbon sinks, including in forests, wetlands, and agricultural lands (e.g. through land-use and conservation measures).

### **2. Increasing the use of wood for construction**

Federal, provincial, and territorial governments will collaborate to encourage the increased use of wood products in construction, including through updated building codes.

### **3. Generating bioenergy and bioproducts**

Federal, provincial, and territorial governments will work together to identify opportunities to produce renewable fuels and bioproducts, for example, generating renewable fuel from waste.

### **4. Advancing innovation**

Federal, provincial, and territorial governments will work together to enhance innovation to advance GHG efficient management practices in forestry and agriculture.



## APPENDIX B LIST OF WITNESSES

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The following table lists the witnesses who appeared before the Committee at its meetings related to this report. Transcripts of all public meetings related to this report are available on the Committee’s [webpage for this study](#).

| <b>Organizations and Individuals</b>  | <b>Date</b> | <b>Meeting</b> |
|---|-------------|----------------|
| <p><b>Department of Agriculture and Agri-Food</b></p> <p>John Fox, Director General<br/>Innovation Programs Directorate, Programs Branch</p> <p>Javier Gracia-Garza, Director General<br/>Ontario - Quebec Region, Science and Technology Branch</p> <p>Matt Parry, Director General<br/>Policy Development and Analysis Directorate, Strategic Policy Branch</p>                       | 2018/11/22  | 133            |
| <p><b>Department of Natural Resources</b></p> <p>Werner Kurz, Senior Research Scientist<br/>Canadian Forest Service</p> <p>Tony Lemprière, Senior Manager<br/>Climate Change Policy, Canadian Forest Service</p> <p>Beth MacNeil, Assistant Deputy Minister<br/>Canadian Forest Service</p> <p>Anne-Hélène Mathey, Director<br/>Economic Analysis Division, Canadian Forest Service</p> | 2018/11/22  | 133            |
| <p><b>Department of the Environment</b></p> <p>Judy Meltzer, Director General<br/>Carbon Pricing Bureau</p> <p>Vincent Ngan, Director General<br/>Horizontal Policy, Engagement and Coordination</p>  | 2018/11/22  | 133            |
| <p><b>Canadian Roundtable for Sustainable Crops</b></p> <p>Susie Miller, Executive Director</p>   | 2018/11/27  | 134            |

| <b>Organizations and Individuals</b>  | <b>Date</b> | <b>Meeting</b> |
|---|-------------|----------------|
| <b>Smart Prosperity Institute</b><br>Mike Moffatt, Senior Director  | 2018/11/27  | 134            |
| <b>Biological Carbon Canada</b><br>Don McCabe, Director<br>Nevin Rosassen, Chairman   | 2018/11/29  | 135            |
| <b>Bon Eco Design</b><br>Carolyn Butts, Co-Owner<br>Hans Honegger, Co-Owner   | 2018/11/29  | 135            |
| <b>Forest Products Association of Canada</b><br>Robert Larocque, Senior Vice-President<br>Kate Lindsay, Vice-President<br>Sustainability and Environmental Partnerships | 2018/11/29  | 135            |
| <b>Canadian Canola Growers Association</b><br>Rick White, Chief Executive Officer   | 2018/12/04  | 136            |
| <b>Canadian Federation of Agriculture</b><br>Ron Bonnett, President   | 2018/12/04  | 136            |
| <b>Canola Council of Canada</b><br>Brian Innes, Vice-President<br>Public Affairs  | 2018/12/04  | 136            |
| <b>As an individual</b><br>Susan Wood-Bohm  | 2018/12/06  | 137            |
| <b>Dow Chemical Canada Inc.</b><br>W. Scott Thurlow, Senior Advisor<br>Government Affairs   | 2018/12/06  | 137            |
| <b>FPIinnovations</b><br>Jean-Pierre Martel, Vice-President<br>Strategic Partnerships<br>Stéphane Renou, President and Chief Executive Officer                          | 2018/12/06  | 137            |
| <b>Front commun québécois pour une gestion écologique des déchets</b><br>Karel Ménard, Executive Director   | 2018/12/06  | 137            |
| <b>Wood Pellet Association of Canada</b><br>Gordon Murray, Executive Director   | 2018/12/06  | 137            |



| <b>Organizations and Individuals</b>  | <b>Date</b> | <b>Meeting</b> |
|---|-------------|----------------|
| <b>Advanced Biofuels Canada</b><br>Doug Hooper, Director<br>Policy and Regulations            | 2018/12/11  | 138            |
| <b>Agricultural Institute of Canada</b><br>Kristin Baldwin, Director<br>Stakeholder Relations | 2018/12/11  | 138            |
| <b>First Carbon Credits Corporation</b><br>Robert Coulter, Vice-President                     | 2018/12/11  | 138            |



## APPENDIX C LIST OF BRIEFS

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The following is an alphabetical list of organizations and individuals who submitted briefs to the Committee related to this report. For more information, please consult the Committee's [webpage for this study](#).

**Agriculture Institute of Canada**



## REQUEST FOR GOVERNMENT RESPONSE

Pursuant to Standing Order 109, the Committee requests that the government table a comprehensive response to this Report.

A copy of the relevant *Minutes of Proceedings* ([Meetings Nos. 133 to 138, 141, 142, 146 and 147](#)) is tabled.

Respectfully submitted,

John Aldag  
Chair



## **DISSENTING REPORT FROM THE OFFICIAL OPPOSITION CONSERVATIVE MEMBERS REGARDING THE REPORT ON FORESTRY, AGRICULTURE, AND WASTE.**

### **SUMMARY**

The Conservative members of the Standing Committee on Environment and Sustainable Development were prepared to work with other members of the Committee to create a robust and thorough report on the state of Canada's forestry, agriculture, and waste within the context of clean growth and climate change. This report includes a number of points of agreement where the Committee has highlighted opportunities for improved management of wetlands, farmlands and forests to reduce greenhouse gas (GHG) emissions in Canada and increase sequestration of carbon from the atmosphere. However, the report's reliance on costly programs and recommendations and the report's endorsement of carbon pricing imply an increased financial and tax burden on Canadians and compels Conservative members of the Committee to withdraw their support of this report. The Report also includes recommendations which potentially infringe on provincial and territorial jurisdiction.

### **COST UNCERTAINTY**

This Report aims to examine the ways in which GHG emissions can be reduced and sequestered in the forestry, agriculture, and waste sectors in Canada. Some who appeared before the committee as witnesses presented compelling ideas that offered ways in which the federal government can work with the provinces and territories, municipalities, industry and individual Canadians to lower or naturally sequester GHG emissions. However, these ideas come with a cost which can disproportionately affect Canadian industries and those who work in them. These costs put pressure on Canadian farmers and foresters which, in turn, can make things more costly for average Canadians. The Conservative members believe that these additional costs have the potential to undermine the competitiveness of Canadian businesses and create undue challenges for Canadian farmers and forestry workers.

The costs associated with many of the recommendations are especially worrisome considering that the Minister of Environment and Climate Change and her Parliamentary Secretary have recently been unwilling to appear before this very Committee to discuss matters contained in the supplementary estimates. The Conservative members are concerned that, without a commitment to transparency in how the Minister's department spends taxpayers money, the implied costs to government imbedded within the recommendations outlined in this report will exacerbate the fiscal challenges facing the federal government and further impair any efforts to balance the federal budget in the short to medium term.

We believe the Liberal Government must use greater caution before embarking upon expensive programs which will worsen Canada's fiscal situation.

## THE PAN-CANADIAN FRAMEWORK AND CARBON TAX

This report relies heavily on the Liberal Government’s Pan-Canadian Framework on Climate Change (the “Climate Change Plan”), a plan which is intended to help Canada meet its *Paris Agreement* targets for GHG emissions reductions. The Climate Change Plan is comprised of four pillars, the first of which is a carbon tax. Carbon pricing schemes often transform into cash grabs from revenue-hungry governments which invariably spend those revenues on their own political priorities rather than on the priorities of Canadians. Carbon taxes also undermine affordability for individual Canadians and the competitiveness of Canadian businesses. While this report only briefly mentions carbon pricing, the relationship between this report and the Pan-Canadian Framework makes it challenging to separate the two.

The report includes a section on carbon pricing in the agricultural sector, which seeks to facilitate the selling of carbon credits from forests, farms, and ranches.<sup>1</sup> The report depicts this as an “opportunity” for farmers to participate in a carbon market. While one witness described a carbon-credit system, the application of a carbon tax was also suggested.<sup>2</sup> The Conservative members strongly oppose any form of carbon tax, particularly on an industry as essential as agriculture. It is unfortunate that some witnesses viewed the agriculture industry as needing government intervention. In the words of one witness, “at the end of the day, we’re looking at what behavior needs to be changed here”, implying that Canadian agriculture requires the heavy hand of government to reduce its GHG emissions.<sup>3</sup> Another witness noted that agriculture’s low profit-margin can mean it is susceptible to carbon leakage, namely the threat of agri-businesses leaving Canada and moving to a lower tax jurisdiction like the United States.<sup>4</sup> Regrettably, the Report’s discussion of a carbon tax is not nuanced but is explicit in its preference for carbon taxation.

The Conservative members cannot support a report which encourages the implementation of a federal carbon tax.

## JURISDICTIONAL SOVEREIGNTY

While waste management, forestry and agriculture fall under shared jurisdiction in Canada, the federal government’s reach is fairly limited. For instance, jurisdiction for waste management, reduction and recycling policies and programs all fall within the purview of provincial and territorial governments, while things such as interprovincial and international movement of hazardous waste fall within the authority of the federal government.<sup>5</sup> This could be problematic as some of the recommendations in the report appear to fall, at least in part, within provincial and territorial jurisdiction. This includes Recommendation 16 which references a harmonized national model recycling system.<sup>6</sup> The report also conceptualizes a nationally-harmonized waste

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<sup>1</sup> Report on Forestry, Agricultural and Waste, version 2, p. 63.

<sup>2</sup> *Ibid*, p. 63.

<sup>3</sup> *Ibid*, p. 64.

<sup>4</sup> *Ibid*, p. 64.

<sup>5</sup> *Ibid*, p. 10.

<sup>6</sup> *Ibid*, p. 3.



management system across Canada that sets out clear and understood expectations for consumers.<sup>7</sup> However, securing broad provincial/territorial buy-in will be difficult, if not impossible, to achieve. One need only look at the fractured consensus on a national carbon tax to imagine the difficulties the federal government will face in trying to achieve a national consensus on how to apply climate change policies to the forestry, agriculture and waste industries.

## **RECOMMENDATIONS**

In light of the concerns outlined above, the Conservative members of the Committee recommend that:

- The federal Government use greater caution when embarking on expensive programs that only result in affordability issues for Canadians and a high burden on Canadian taxpayers.
- The Committee call upon the federal Government to remove the federal carbon pricing backstop.
- The federal Government respect the autonomy of the provinces and territories to create their own environmental and tax policies.
- The Committee emphasize the necessity for the federal Government to prioritize provincial and territorial autonomy when proposing a harmonized waste-management system.

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<sup>7</sup> *Ibid*, p. 73.

