

VOICES FOR GOOD AIR

MEASURING, INVENTORYING, AND REPORTING OF GREENHOUSE GAS EMISSIONS FROM FORESTRY SLASH BURNING BY BRITISH COLUMBIA

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Requirements

Under the Kyoto and Paris global warming agreements, to which Canada is a signatory, Canada is obliged to inventory and report its greenhouse gas emissions. See the federal government document *About Canada's Greenhouse Gas Inventory*, available at:

<https://www.ec.gc.ca/ges-ghg/default.asp?lang=En&n=83A34A7A-1>

Canada's greenhouse gas inventory is developed, compiled, and reported annually by the Pollutant Inventories and Reporting Division of Environment Canada with input from numerous experts and scientists across Canada. While the inventory is prepared in accordance with the United Nations Framework Convention on Climate Change (UNFCCC) reporting guidelines on annual inventories, [Decision 24/CP.19](#), inventory estimates are determined by methods and models developed in-house by engineering and scientific staff, as well as from published data, data developed by industry, or methods developed by the [Intergovernmental Panel on Climate Change \(IPCC\)](#).

The greenhouse gases that have been estimated in the national inventory are carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), sulphur hexafluoride (SF₆), nitrogen trifluoride (NF₃), perfluorocarbons (PFCs), and hydrofluorocarbons (HFCs). The inventory uses an internationally agreed to reporting format, grouping emissions and removals into the following five Sectors:

- [Energy](#)
- [Industrial Processes and Product Use](#)
- [Agriculture](#)
- [Land Use, Land-Use Change and Forestry](#)
- [Waste](#)

Inventory experts are responsible for the development, analysis and verification of activity data, methods, emission factors and the emission and removal estimates; management of the quality and archiving systems; and performance of trends analysis. Emissions or removals are usually calculated or estimated using mass balance, stoichiometry or emission factor relationships under average conditions. In many cases, activity data are combined with average emission factors to produce a top-down national inventory. Large-scale regional estimates, based on average conditions have been used for a broad range of sources, such as transportation and emissions from landfills are determined using a simulation model to account for the long term slow generation and

release of these emissions. The approach to estimating emissions and removals from manipulated biological systems such as agriculture land or forestry includes a combination of repeated measurements and modeling.

In addition, [quality assurance and quality control \(QA/QC\)](#) procedures are integral parts of the inventory development and submission process. These are implemented from the initial data collection stage, through the development of emission and removal estimates and publication.

One sector not currently included in national greenhouse gas (GHG) totals under international agreements is “Land Use, Land-Use Change and Forestry” (LULUCF). Although not reported in national totals, LULUCF contributions to national totals are supposed to be inventoried and reported. Again, see the federal government document *About Canada’s Greenhouse Gas Inventory*, at <https://www.ec.gc.ca/ges-ghg/default.asp?lang=En&n=83A34A7A-1>:

Land Use, Land-Use Change and Forestry

The Land Use, Land-Use Change and Forestry (LULUCF) sectors report net greenhouse gas fluxes between the atmosphere and Canada’s managed lands, as well as those associated with land-use changes. The assessment includes emissions resulting from human-induced fires and controlled burning, and conversion to cropland.

For the purpose of the inventory, managed forests are those managed for timber and non-timber resources (including parks) or subject to fire protection.

All emissions from and removals by the LULUCF sector are excluded from the national total.

See also the United Nations Framework Convention on Climate Change, **Reporting of the LULUCF sector by Parties included in Annex I to the Convention:** http://unfccc.int/land_use_and_climate_change/lulucf/items/4127.php

Why are LULUCF emissions not included in national totals?

To date, LULUCF emissions have been excluded from national GHG inventory totals because there is disagreement over how to handle them. Questions of fairness are at stake. However, international discussions are under way on how to measure, inventory, and report them, and consensus may be near.

How are LULUCF emissions compiled?

See the quotations above; and to repeat:

Accurate and transparent monitoring, reporting and verification of Canada's greenhouse gas (GHG) emissions and removals is a requirement of the United Nations Framework

Convention on Climate Change (UNFCCC). This is also key to demonstrating Canada's progress in reducing greenhouse gases and combating climate change.

Yet Web-published descriptions of the Canadian LULUCF methodology are not transparent, they are opaque; they can mean little except to the “experts” who work in the federal and provincial departments and ministries involved. The federal LULUCF data appears to derive mostly from the output from provincial models. For the B.C. methodology, see below.

Government of Canada figures for Canadian net total GHG emissions from forestry

In April, the Government of Canada submitted its estimates for greenhouse gas emissions and removals to the United Nations in the document *National Inventory Report 1990-2015: Greenhouse Gas Sources and Sinks in Canada; Canada's Submission to the United Nations Framework Convention on Climate Change*. Part 1 includes estimates for LULUCF emissions and withdrawals. The estimates for 2015 are that **net withdrawals** in the preceding year were 160,000 kilotonnes (160 megatonnes) of CO₂ equivalent and they give the same figure of 160,000 kilotonnes for the years 2010, 2011, 2012, 2013, and 2015. See Chapter 6, http://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/10116.php.

It seems counterintuitive that clearcutting mature forests and replacing them with plantations that will not reach the same carbon content for most of a century should be reported as producing a net withdrawal of GHG. What could explain these figures?

One factor in the calculations must be that the construction lumber issuing from logging sequesters carbon. Unfortunately, the research on carbon sequestration in manufactured wood suggests that much waste occurs even after structural wood has been retailed, because of cutting to size, temporary uses, and so on. But secondly, the average longevity of manufactured wood in structures is surprisingly low. See, for example, Ingof Profft, Martina Mund, Georg-Ernst Weber, Eberhard Weller, and Ernst-Detlef Schulze, 2009, “Forest management and carbon sequestration in wood products,” *European Journal of Forest Research* 128(4): 399-413; from the abstract, “The average MRT [Mean Residence Time] of carbon in harvested wood products was 20 years.” Thirdly, and still worse, when a tract of boreal forest is clearcut, only a modest fraction of the biomass killed or badly disturbed is even hauled out of the bush. See A. Virkkula et al., “Prescribed burning of logging slash in the boreal forest of Finland...,” 2014, *Atmospheric Chemistry and Physics* 14: 4473-4502.

A more reasonable explanation for how logging could result in net GHG withdrawals in the Canadian GHG inventory is as follows. Environment Canada seems to rely heavily on modelling to arrive at its figures. Presumably it feeds in data for (i) the area of forest land clearcut each year, and (ii) the area of land in plantations already growing, combined with estimates for the growth of plantation trees year by year, figures which of course would represent increases in carbon sequestration. Because so much of Canadian forest land has been cut over since World War II, the *regrowth* on land already logged would outweigh the *greenhouse gas contributions*, including those from slash burning, from the amount of forest cut in a single

contemporary reporting year. Regrowth might be, let us say, 70 times the liquidation of forest in a single contemporary reporting year. Following this logic, it would probably not even be worth while attempting to tally the actual carbon contributions from forest land clearcut in the present year; they could just be approximated and entered into the models.

The trouble with this line of thinking, of course, is that the carbon budget of past logging and regrowth is like an inheritance, whereas the carbon budget of logging and regrowth over the next 15 years, more or less, before climate change becomes irreversible is like annual income weighed against annual expenditures – and during those 15 years, regrowth from new logging will be all but negligible as compared with the carbon contributed from the forest cut. During the next 15 years, the *unnecessary* GHG contributions slash burning alone makes to the atmosphere could add up to something like 15 x 30 megatonnes = 450 megatonnes for British Columbia alone, and something on the order of 1,000 megatonnes for Canada as a whole.

In other words, modelling of this sort simply trivializes the huge GHG contributions slash burning makes in the present, or even renders them invisible. It comports with the commonsense notion that forestry is neutral from a climate change perspective because trees cut down today will simply regrow – commonsense but irrelevant, because the world does not have 80 years to grow new trees. It also gives warrant to the very dangerous idea that the way for forestry to fight climate change is for governments to encourage even more clearcutting than is currently being done.

British Columbia inventorying of greenhouse gas emissions from slash burning

A small amount of information about the methodology used by the Government of British Columbia to inventory LULUCF GHG emissions is provided in *Methodology Document for the British Columbia Provincial Greenhouse Gas Methodology*; see:

https://www2.gov.bc.ca/assets/gov/environment/climate-change/data/provincial-inventory/2014/303525_provincial_inventory-2014-methodology.pdf

The LULUCF sector is treated over several pages starting on p. 25. This document confirms that the basic method is to model GHG removals from forest land via data on stand growth, then subtract modelled emissions from, among other sources, slash burning. The *Methodology Document* does NOT state where the data on emissions from slash burning come from.

So far as Voices has been able to determine, the Government of British Columbia does not actually measure GHG emissions from slash burning (personal communications from responsible officials in the Ministry of Forests, Lands, and Natural Resource Operations, 2017). A reasonable supposition is that B.C. just runs models incorporating yearly data about amounts of forest land clearcut and informed estimates (or eyeball guesses) about slash production per hectare on the timber berths cut, or even the ratio of AAC to slash as estimated by company foresters. If this assessment of the situation is correct, and indeed it is the case that *in B.C. there is no actual counting and weighing of slash piles*, then the B.C. LULUCF inventory may be wildly inaccurate because models are notorious for their sensitivity to data: Garbage in, Garbage out. From its own calculations, Voices believes GHG emissions from B.C. slash burning are far larger than the B.C. government has been reporting.

For Web information on B.C. inventorying, see the Web document *Provincial Greenhouse Gas Inventory*:

<https://www2.gov.bc.ca/gov/content/environment/climate-change/data/provincial-inventory>

In 2014, British Columbia's greenhouse gas emissions were 62.7 million carbon dioxide equivalent tonnes (Mt CO₂e), including 1.8 Mt CO₂e in offsets from forest management projects. Greenhouse gas emissions were down 5.5% from 66.3 Mt CO₂e in 2007, our baseline year.

British Columbia's Provincial Inventory is the province's assessment of greenhouse gas sources and sinks in British Columbia. The inventory tables cover all GHG emissions included in the province's greenhouse gas targets. The tables also include emissions or removals from land use change and forest management. These are not included in the province's greenhouse gas targets, but are reported for additional information.

The Climate Action Secretariat prepares British Columbia's greenhouse gas inventory and publishes the inventory tables each year, with a two-year delay to allow time to assemble the information. The [2014 provincial inventory](#) (XLSX, 71 KB) was published in 2016.

Another Web document providing a modicum of information about how B.C. calculates LULUCF emissions is *Provincial Greenhouse Gas Emissions – Frequently Asked Questions*, at: <https://www2.gov.bc.ca/gov/content/environment/climate-change/data/provincial-inventory/faq>

Why are unconverted forest land, wetland, cropland and settlement emissions not included in the provincial total?

These emission categories are presented as memo items and are not currently counted towards the provincial total because: (1) Environment and Climate Change Canada does not include these emissions in national totals; (2) emissions from these categories are both large and volatile due to natural causes largely outside of human control (such as wildfire and pests).

Why are afforestation and deforestation included within the provincial emissions total?

Afforestation and deforestation are included because: (1) adequate quantification methods are available that do not lead to a tendency to over- or under-estimate B.C.'s reported emission levels; (2) there is greater direct human control over these emissions; and (3) B.C. clearly indicated in its 2008 Climate Action Plan that actions to address forest-related emissions were an important part of reaching greenhouse gas targets.

Why have forest land emissions changed from earlier years?

International accounting standards now include the assumption that wood products sequester carbon. When a tree is harvested, all of the carbon in that tree may not be released into the atmosphere immediately. Treatment of wood products has been adjusted for this factor starting in the 1990-2013 inventory year. Forest land emissions now include harvested wood products' decomposition emissions from harvest.