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2023 LOGGING EMISSIONS UPDATE

The Net Greenhouse Gas Emissions from Logging in Canada in 2021

Michael Polanyi, Nature Canada
Jennifer Skene, Natural Resources Defense Council[1]

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SUMMARY

The Government of Canada does not transparently report the greenhouse gas emissions from one of its highest-emitting sectors, the logging industry. While it is possible to piece together the net emissions attributable to industrial logging from government data, it is difficult to do so, as this information is scattered across myriad government sources.

Despite clear indications from the Intergovernmental Panel on Climate Change that achieving global climate targets requires action across all sectors, Canada's recently updated *National Inventory Report (1990-2021): Greenhouse Gases Sources and Sinks*[2] follows the practice of prior reports, failing to clearly indicate the level of net greenhouse gas emissions for which the logging industry is responsible. Instead, Canada reports the "net flux from managed forests and resulting harvested wood products", a category that encompasses dynamics and management practices beyond what is reasonably attributable to industrial logging and, as a result, downplays the sector's climate impact. In 2021, the government's net flux figure constituted a sink of 9.1 Mt carbon dioxide equivalent (CO_2e).[3]

The lack of transparency about logging emissions in the National Inventory Report (NIR) is transposed onto the government's 2030 Emissions Reduction Plan,[4] leaving a significant gap in the government's climate strategy. Scientists;[5] health and environmental groups;[6] and most recently, Canada's Commissioner of the Environment and Sustainable Development,[7] have raised concern about the negative impact this lack of transparency is having on the effectiveness of Canada's climate policies.

Given this gap in transparency, in 2022 Nature Canada and the Natural Resources Defense Council calculated the net emissions associated with the logging industry using figures distributed across Canada's NIR (1990-2020) and additional data provided by Environment and Climate Change Canada.[8] That analysis concluded that net greenhouse gas emissions from logging in 2020 (latest data available) were approximately 75 Mt CO_2e, a stark contrast to the Government's -9 Mt net flux figure.

In this report, we update that analysis by calculating net emissions from logging for the year 2021, using data from Canada's most recent NIR. **We conclude that net GHG emissions from logging in 2021 were 73 Mt, 11% of Canada's total 2021 GHG emissions.**

METHODOLOGY

The methodology used to calculate net logging emissions is described in detail in our 2022 report.[9] In brief, the calculation derives from three key variables:

- **Item #1: Carbon in harvested wood (in CO_2e).** We start with the emissions that would occur if all the carbon in the wood the logging industry extracted from the forest in a given year were released immediately into the atmosphere.

- **Item #2: Net carbon added to long-lived wood products pool (in CO_2e).** Some of the carbon in Item #1, rather than being immediately released, is deferred into the future because it is stored in the form of long-lived products (e.g. lumber), so we accounted for the net amount of deferred emissions (i.e. carbon added to the long-lived wood product pool minus CO2 released from wood in that pool reaching its end of life).

- **Item #3: Net carbon flux from re-growth after logging (in CO_2e).** Following industrial logging, the forest acts as a carbon source for a number of years, emitting carbon from soil and forest debris. We combine these emissions with the totality of the carbon captured across the managed forest by stands that, following initial years of emissions post-logging, are regenerating and acting as net carbon sinks. Because the carbon removals (i.e. carbon sequestration) outweigh the emissions, this generates a net negative figure, which is added to the totals.

Net Logging Emissions are the sum of items 1 to 3 (items two and three are usually negative, indicating that they constitute carbon sinks).

Data was sourced exclusively from the accompanying tables of Canada's NIR (1990-2021).[10] See Appendix A for further details on data sources.

All figures exclude emissions associated with the conversion of forest land to other uses (16 Mt CO_2e in 2021) and with the creation of new forest land, i.e., afforestation (0.17 Mt CO_2e).[11] Deforestation, resulting from processes such as the expansion of agriculture, oil and gas operations, and urban areas, is arguably more reasonably attributed to the sectors driving it than to the logging industry.[12] As a result, we restricted our estimates to "forest land remaining forest land" – land on which trees are replanted or allowed to naturally regenerate after logging.

Our estimate of logging emissions is conservative in several ways.

First, our estimates do not include emissions from the logging industry's use of fossil fuels, notably in its vehicles and pulp and paper mills. Arguably, pulp and paper production is an integral part of the logging industry, but at present it is often viewed as a separate economic sector. The GHG inventory estimates 8 Mt CO_2e of emissions from the use of fossil fuels in pulp and paper production in 2020.[13]

In addition, there are a number of limitations in Canada's GHG inventory that likely lead to understimates in our calculations.[14] This includes the fact that the monitoring data Canada uses does not include the impact of "logging scars," areas where forest cover has failed to meaningful regrow, even decades following logging.

FINDINGS

Using the methodology described in the previous section, we calculated net logging emissions for 2021 to be 73 Mt CO_2e.

This value was derived by summing the carbon in harvested wood in a given year (Item1, 141 Mt CO_2e), the net carbon added to long-lived products (Item 2, -15 Mt CO_2e), and the net carbon flux from regrowth after logging (Item 3, -53 Mt CO_2e). All values for 2021 emissions can be found in Table 1, and the values for previous years (2005-2020) can be found in Appendix B.

Net logging emissions fell slightly from 2020, and have in general fallen since 2005 due to a reduction in area logged. Note that ECCC recalculates historic forestry emissions each year, so past emissions numbers presented in this report differ from our previous report.[15]

For illustrative purposes, we compared the 2021 net logging emissions value to emissions from oil sands production and electricity production, as described in the NIR (Figure 2). We found that in 2021 logging emissions were more than 20 Mt higher than emissions from electricity production, and about 12 Mt less than emissions from oil sands production (See Table 4 and Figure 2).

Item	Description	Value (Mt CO2e)
1	Carbon in harvested wood	141
2	Net carbon added to long-lived products	-15
3	Net carbon flux from re-growth after logging	-53
Net Logging Emissions	Sum of three components above	73

Table 1. 2021 values for Items 1-3 and net logging emissions. Values in this table have been rounded. Negative values indicate a carbon sink, while positive values show a carbon source.

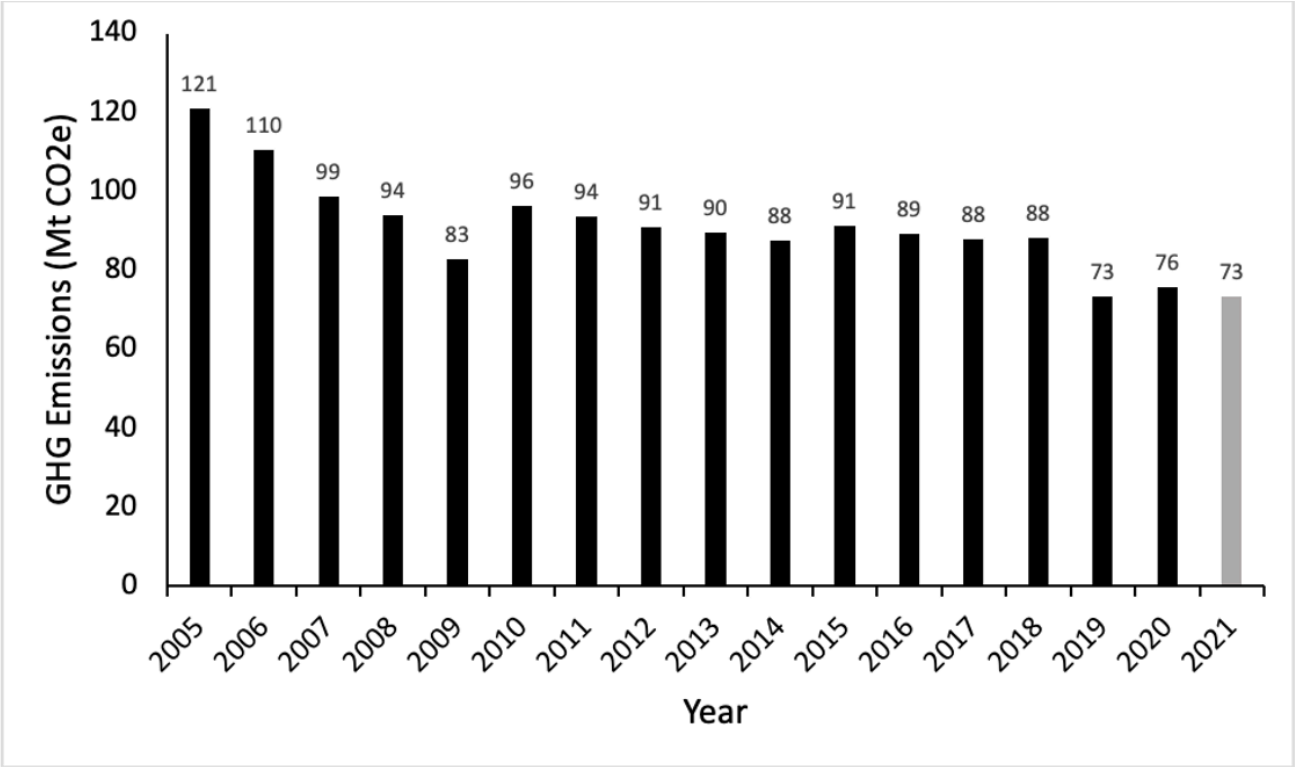

Figure 1. Values for 2021 net logging emissions. The lighter bar indicates the recent 2021 values.

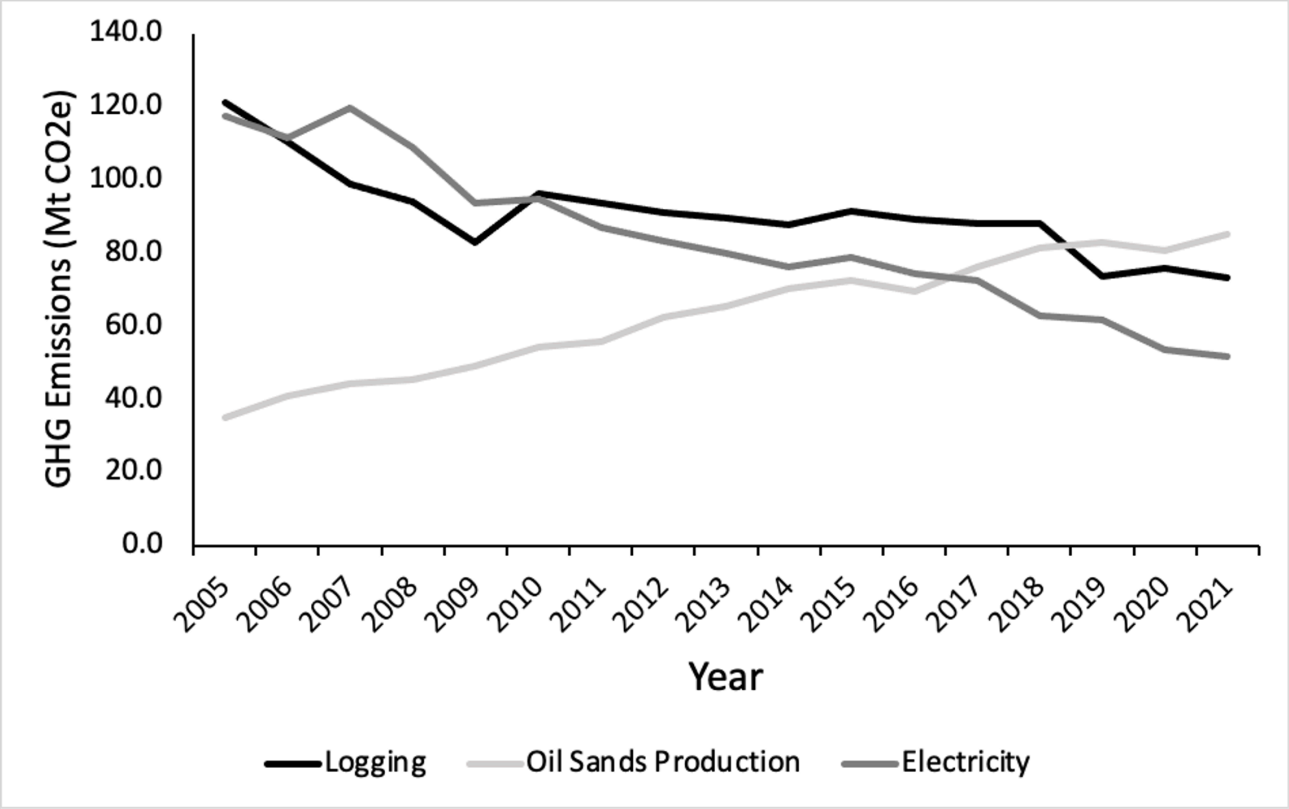

Figure 2. Comparison between net logging emissions and emissions attributed to the oil sands production and electricity sectors, as reported in Canada's National Inventory Reports (2005-2021).

CONCLUSIONS

Six main conclusions can be drawn from this updated calculation of net logging emissions.

1) GHG emissions from industrial logging remain large. Logging is one of the highest emitting sectors in Canada, contributing more than 11% of Canada's total annual GHG emissions in 2021.

2) Canada does not transparently report logging emissions. While Canada clearly reports emissions from "harvested wood products" in its National GHG Inventory (i.e. emissions released when harvested wood is burned or reaches the end of its lifespan), it reports this number in combination with a massive "forest land" sink, which includes carbon removals from commercially mature trees that have regrown following wildfires and therefore are not reasonably attributable to the logging industry (see point 4 below). As a result, it is difficult, without the extensive data compilation and calculations undertaken, to determine the net emissions for which the logging sector is responsible.

3) Canada portrays industrial logging as a carbon sink. Canada's top-line reported number for the forestry sector, "net flux from managed forests and resulting harvested wood products", was -9.1 Mt in 2021.[17] This headline figure, which is frequently cited in communications around the impact of industrial logging,[18] creates the misleading impression that logging in Canada is carbon-neutral or a net sink.

4) Canada's portrayal of logging as a carbon sink results from a biased treatment of emissions and removals from natural disturbances. Canada does not count emissions from wildfires (reported as 287 Mt in 2021)[19] in its country total because it deems these fires to be out of control of human activity, and the NIR is meant to reflect anthropogenic emissions and removals. However, in 2021, Canada claimed credit for 79 Mt of carbon removals associated with the regrowth of "commercially mature" trees after wildfires[20] (the average age of commercial maturity is 76 years) as anthropogenic, even though the tree growth creating this sink involves no more human intervention than the wildfires whose emissions were excluded. The result is that the "net flux" Canada reports represents a massive overreporting of anthropogenic removals from forest land.[21]

5) The portrayal of logging as carbon neutral is leading to counterproductive policy decisions. By failing to accurately and transparently report the GHG emissions from industrial logging, Canada is allowing one sector of the economy to freely pollute the atmosphere, thereby increasing the burden of emissions reductions on other sectors and externalizing costs to future generations. The lack of clear and accurate reporting of logging emissions is also distorting climate policy-making, as officials currently lack the data around industrial's logging impact required to advance science-driven, effective solutions. Finally, this lack of

transparent reporting is hindering the necessary transition of the logging industry to a low-carbon, climate-safe sector that can compete in a marketplace that increasingly demands sustainable practices and products.

6) Canada should fix the logging gap in its climate plan in 2023. Environment and Climate Change Canada and Natural Resources Canada have indicated that they intend to conduct a review of Canada's approach to forest carbon accounting, and will engage stakeholders in this discussion in order to better account for anthropogenic forest sector emissions in the 2024 NIR. This review process is an important opportunity to address the current lack of transparent reporting of net logging emissions, and Canada's biased treatment of natural disturbances. By transparently and accurately reporting logging emissions in or alongside the 2030 Emissions Reduction Plan progress report and 2024 NIR, Canada can fill a major gap in its climate plan and lay the groundwork essential to putting in place more effective policies to reduce the impact of this high-emitting sector.

Appendix A. Data Sources

Table A1. Data and sources for item #1: Carbon in harvested wood (in CO2e terms)

operation	Component	Source
(none)	Carbon in all wood harvested in a given year	NIR Part 1, Table 6-7, Carbon Stock inputs line[22]
minus	Carbon in wood from forest conversion (deforestation)	NIR Part 1, Table 6–7, sum of rows 3–5
minus	Carbon in residential firewood taken from agricultural and urban (non-forest) land	NIR Part 1, Table 6–7, sum of rows 7–8
multiply by 44/12	Sum of three components above, multiplied to convert mass of carbon to mass of CO_2	44 is the molecular weight of CO_2; 12 is the atomic weight of carbon

Table A2. Data and sources for item #2: Net carbon added to long-lived products (in CO2e terms)

operation	Component	Source
(none)	Total emissions from harvested wood products	NIR Part 1, Table 6-7, emissions line
minus	Emissions from harvested wood products originating from forest conversion (deforestation)	NIR Part 1, Table 6–8, row 2 for each year
minus	Carbon in residential firewood taken from agricultural and urban (non-forest) land, multiplied by 44/12 to convert to CO_2	NIR Part 1, Table 6–7, sum of rows 7–8
minus	Carbon in harvested wood from FLFL in a given year (in CO_2 terms)	This is item #1, calculated above

Table A3. Data source for item #3: Net carbon flux from re-growth after logging (in CO2e terms)

operation	Item	Source
(none)	Net removals from tree regrowth after logging on FLFL	NIR Figure 6–3, "Anthropogenic Component, past forest management activities"[23]

Table A4. Data sources for comparison of emissions between sectors (in CO2e terms)

Component	Source
Oil sands production emissions	NIR Part 1, Table 2-12, Oil Sands (mining, in-situ, upgrading)[24]
Electricity emissions	NIR Part 1, Table 2-12, Electricity[25]

Appendix B. Full Results

Table B1. Annual net logging GHG emissions, Mt CO_2e (with past emissions updated to reflect the 2023 NIR)

Year: 20	*05*	*06*	*07*	*08*	*09*	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*	*18*	*19*	*20*	*21*
Wood harvested in a given year	200	182	164	142	120	142	149	153	156	156	159	159	155	160	141	141	141
Net carbon added to long-lived products	-54	-46	-37	-16	6	-6	-13	-17	-20	-20	-23	-24	-20	-24	-16	-16	-15
Net flux from forest regrowth	-25	-26	-28	-32	-44	-40	-43	-45	-46	-48	-44	-46	-47	-47	-52	-50	-53
Net logging emissions	121	110	99	94	83	96	94	91	90	88	91	89	88	88	73	76	73

Table B2. Annual GHG emissions from logging (net), oil sands production, and electricity, Mt CO_2e (with past emissions updated to reflect the 2023 NIR)

Year: 20	*05*	*06*	*07*	*08*	*09*	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*	*18*	*19*	*20*	*21*
Logging	121	110	99	94	83	96	94	91	90	88	91	89	88	88	73	76	73
Oil sands production	35	41	44	45	49	54	56	62	65	70	72	69	76	81	83	81	85
Electricity	118	112	120	109	94	95	87	83	80	76	79	74	73	63	62	54	52

Table B3. Annual net logging GHG emissions, Mt CO_2e (as presented in 2022 report, before recalculation):

Year: 20	*05*	*06*	*07*	*08*	*09*	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*	*18*	*19*	*20*
Wood harvested in a given year	200	182	165	143	122	144	150	152	155	155	160	159	158	159	143	142
Net carbon added to long-lived products	−55	−50	−38	−16	2	−12	−15	−20	−19	−19	−25	−27	−26	−24	−17	−18
Net flux from forest regrowth	−25	−25	−27	−33	−45	−40	−43	−46	−47	−49	−45	−47	−49	−49	−54	−49
Net logging emissions	120	107	99	94	79	92	91	86	89	87	90	85	84	87	72	75

Note: negative numbers in rows 2 and 3 represent respectively *positive* amounts of (i) carbon added to long-lived-products and (ii) CO_2 removed from the atmosphere.

Table B4. Annual GHG emissions from logging (net), oil sands production, and electricity, (Mt CO_2e) (as presented in 2022 report, before recalculation):

Year: 20	*05*	*06*	*07*	*08*	*09*	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*	*18*	*19*	*20*
Logging	120	107	99	94	79	92	91	86	89	87	90	85	84	87	72	75
Oil sands production	35	41	44	45	49	54	56	62	65	70	73	70	77	82	83	81
Electricity	118	112	120	109	94	95	87	83	80	76	80	74	73	63	62	56

Endnotes

1. The authors would like to thank David Bysouth for data analysis support, and Priscilla Santos of Nature Canada and Julee Boan of NRDC, for valuable input and support.

2. Environment and Climate Change Canada (2023). National Inventory Report 1990–2021: Greenhouse Gas Sources And Sinks In Canada. Canada's Submission To The United Nations Framework Convention On Climate Change.

3. Unless stated otherwise, all emissions estimates given in Mt represent emissions of GHGs in Mt CO2e, or CO2 equivalent.

4. Environment and Climate Change Canada (2022). 2030 Emissions Reduction Plan.

5. Letter from Scientists to Prime Minister Justin Trudeau Regarding the Protection of Canada's Primary Forests, March 23, 2022.

6. An open letter to the Government of Canada from more than 70 conservation, climate, and health groups, November 2, 2022.

7. Office of the Auditor General of Canada (2023). Reports of the Commissioner of the Environment and Sustainable Development to the Parliament of Canada: Forests and Climate Change.

8. See Skene, J. and Polanyi, M. (2022). Lost in the Woods: Canada's Hidden Logging Emissions are Equivalent to Those From Oil Sands Operations. Bramley, M. and Saul, G. (2022). What are the Net Greenhouse Gas Emissions From Logging in Canada?.

9. Bramley and Saul (2022).

10. See Chapter 6 Figures - Underlying data and Chapter 6 Tables - Underlying Data.

11. Environment and Climate Change Canada (2023), Table 6-1.

12. Wildlands League has shown that significant and permanent loss of forest is caused by logging roads and landings; however, Canada does not report those emissions. See Bramley, M. (2021), Canada's Approach to Forest Carbon Quantification and Accounting: Key Concerns, p. 7-8.

13. Environment and Climate Change Canada (2023), Annex 10, Table A10-2, https://data-donnees.ec.gc.ca/data/substances/monitor/canada-s-official-greenhouse-gas-inventory/B-Economic-Sector/?lang=en.

14. See Bramley and Saul (2022), p. 9-10.

15. See Environment and Climate Change Canada (2023), Part 1, p. 227.

16. We compared the logging sector to other GHG Inventory sectors as a means of illustrating the scale of logging sector emissions, and the fact that the logging sector's emissions are on par with other sectors Canada separately reports. Canada's GHG inventory includes downstream emissions from harvested wood products in the LULUCF category, so we included those in our emissions estimate. Canada doesn't include downstream emissions from oil sands operations in its Inventory, so we followed that convention.

17. Environment and Climate Change Canada (2023), Part 1, p. 55.

18. See, for example, Natural Resources Canada (2022). State of Canada's Forests - Annual Report 2022, p. 48-9;

19. Environment and Climate Change Canada (2023), Chapter 6 Figures Underlying Data, Figure 6-3.

20. ibid.

21. The bias involved in Canada's accounting approach is described in detail in Bramley (2021), p. 9-13.

22. The bias involved in Canada's accounting approach is described in detail in Bramley (2021), p. 9-13.

22. Data for Table 6-7 and 6-8 can be found at https://data-donnees.ec.gc.ca/data/substances/monitor/canada-s-official-greenhouse-gas-inventory/E-LULUCF/EN_Ch6_Tables_FullTimeSeries.xlsx.

23. Data for Figure 6-3 can be found at https://data-donnees.ec.gc.ca/data/substances/monitor/canada-s-official-greenhouse-gas-inventory/E-LULUCF/EN_Ch6_Tables_FullTimeSeries.xlsx.

24. NIR, Part 1, p. 65 https://data-donnees.ec.gc.ca/data/substances/monitor/canada-s-official-greenhouse-gas-inventory/B-Economic-Sector/?lang=en.

25. ibid.