Dangerous Distractions

Canada's carbon emissions and the pathway to net zero

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Introduction: Net zero is not zero

With the *Canadian Net-Zero Emissions Accountability Act* (Bill C-12) Canada is joining many other nations in setting a target of net zero greenhouse gas (GHG) emissions by 2050. This new target is viewed as an improvement over the previous 80 per cent reduction in net emissions relative to 2005 levels,[1] and more aligned with the objectives of the Paris Agreement. Recent pledges to get to net zero emissions by 2050 include the United Kingdom, European Union, Japan and South Korea. The US Biden administration has also promised aggressive climate action and net zero emissions by 2050, while China is promising peak emissions by 2030 and net zero

1 Government of Canada, *Canada's Mid-Century Long-Term Low-Greenhouse Gas Development Strategy*, 2016, https://unfccc.int/files/focus/long-term_strategies/application/pdf/canadas_mid-century_long-term_strategy.pdf.

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by 2060. At the sub-national level, Nova Scotia, Québec, Newfoundland and the Yukon are targeting net zero emissions by 2050, and British Columbia has also promised a net zero target. Many large corporations are now pledging net zero emissions for their operations.

This paper takes a critical look at what "net zero" commitments really mean. While reducing emissions to zero is a clear concept, net zero muddies the waters in that some GHG or carbon emissions would be permitted as long as they are balanced by "negative emissions" or carbon removals through nature or engineered solutions. Net zero thus contains two objectives, reducing fossil fuel emissions and increasing carbon removals, and proposes that they can be traded off against each other. The federal government is also contemplating buying carbon credits from other jurisdictions, another potential loophole to delay necessary action to reduce domestic emissions.

No detailed plans have been tabled by the federal government about what it means by "net zero," although an advisory panel has been tasked with making recommendations.[2] Modelling for *Canada's Mid-Century Long-Term Low-Greenhouse Gas Development Strategy*, published by the federal government in 2016,[3] showed about one-fifth of the 80 per cent net reduction below 2005 levels by 2050 would come from international carbon credit purchases and forests. Canada has sought to claim credit for carbon sequestration in its forests going back to the Kyoto Protocol, then estimated to be about 20 per cent of its effort towards its target.[4]

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Net zero has the potential to be a dangerous distraction that reduces the political pressure to achieve actual emission reductions in favour of wishful thinking about future technologies and "nature-based solutions." This permits business-as-usual to continue for longer than it should, perpetuating the era of fossil fuels including other adverse health and environmental impacts. Already we can see that all options are on the table for the federal government:

- The new federal climate plan, released in December 2020, relies on increased carbon sequestration in forests towards meeting Canada's 2030 GHG target, as well as other natural and technological measures.
- The Federal GHG Offset System, currently in development, would allow the generation of carbon offsets/credits available for purchase by large industrial polluters.
- While the federal government states it has not decided about using carbon credits from outside Canada, it is participating in international negotiations and has developed a draft Internationally Transferred Mitigation Outcomes (ITMOs) Framework with proposed principles "to guide Canada's engagement in global carbon markets."[5]

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2 The author spoke to the body in March 2021. Government of Canada, Net-Zero Advisory Body, https://www.canada.ca/en/services/environment/weather/climatechange/climate-plan/net-zero-emissions-2050/advisory-body.html.

3 That is, 15 percentage points for credits and forests/nature versus 65 percentage points from reductions in domestic emissions. (Government of Canada, *Canada's Mid-Century Long-Term Low-Greenhouse Gas Development Strategy*.)

4 D. Spittlehouse, "Carbon credits," *Canadian Silviculture*, fall 2002, https://www.for.gov.bc.ca/hre/pubs/docs/spittlehouse_2002.pdf.

5 Draft received by author, March 2021, as part of federal consultation process.

This paper gets into the details on these measures and how they link together. It is imperative that the federal government provides greater transparency and clarity about its intentions and assumptions. It matters what is the final balance between reductions in fossil fuel emissions versus reliance on carbon withdrawals, offsets or purchases of carbon credits from outside the country. And different pathways to net zero have different total carbon budgets (contributions to further warming) associated with them.

It is imperative that the federal government provides greater transparency and clarity about its intentions and assumptions.

For many years, Canada has wanted to have it both ways: talking about climate action at home while ramping up production of the fossil fuels that are the primary cause of climate change. A recent International Energy Agency report, which models a pathway to net zero globally, provides critical context for Canadian policy-makers: "There is no need for investment in new fossil fuel supply in our net zero pathway. Beyond projects already committed as of 2021, there are no new oil and gas fields approved for development in our pathway, and no new coal mines or mine extensions are required."[6] In other words, it is time for a managed wind down of fossil fuel production.

Key findings:

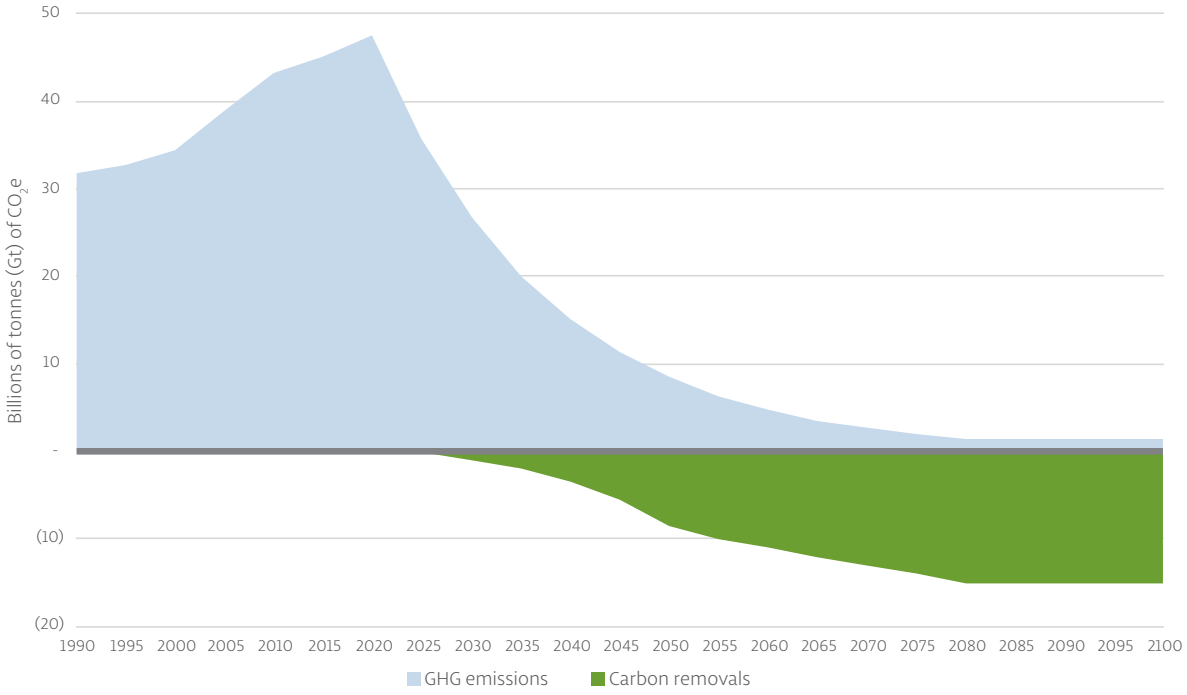
- Canada should focus on real reductions in domestic emissions and fossil fuel production. This means shifting our reliance away from fossil fuels as quickly as possible (and taking on the fossil fuel industry) and being explicit about what industrial sectors cannot be decarbonized.
- Industrial carbon removal technologies will require substantial public subsidies but are not likely to be cost-effective nor scalable to the size of the challenge. They come at an opportunity cost of investments in renewables and other climate actions.
- Conservation of intact (especially old growth) forests and other nature-based solutions, such as the preservation of wetlands, grasslands or coastal areas, should be funded by governments where they support healthy ecosystems and Indigenous rights. However, they should not be used to create carbon offset projects, as it is extremely difficult to know whether a particular project will be permanent and additional to what would otherwise have occurred.
- A massive expansion of global markets for carbon offsets/credits will increase the temptation for policy-makers to bet on removals elsewhere rather than emission reductions at home. This could result in Canada missing its targets entirely.

Negative emissions

Taking a step back, the overarching problem of global temperature increase is caused by human activities that accumulate carbon dioxide (CO_2) in the atmosphere. This is mostly from the use of fossil fuels for energy, with deforestation the other major contributor. These carbon sources act like a blanket trapping more solar

6 International Energy Agency, *Net Zero by 2050: A Roadmap for the Global Energy Sector*, May 2021, https://www.iea.org/reports/net-zero-by-2050.

Figure 1: Net zero by 2050 illustrated: GHG emissions vs carbon removals



Source: Author's illustration based on J. Rogelj et al., "Net-zero emissions targets are vague: three ways to fix," 2021, https://www.nature.com/articles/d41586-021-00662-3.

radiation from the sun. Moving in the other direction are carbon sinks—more than half (55 per cent) of the CO_2 we emit is absorbed by land (mostly forests) and ocean.[7]

CO_2 levels as of March 2021 are at 417 parts per million (ppm), 46 per cent higher than the 286 ppm back in 1850. Our current position is thus one of overshoot[8]—not only do we need to stop the increase in CO_2 concentration, but we also need to bring that level back down to something more like 350 ppm, in order to have a habitable planet for the long run. In addition, there are other greenhouse gases besides CO_2 and these must also be addressed. Methane (CH_4 aka "natural gas"), for example, is far more heat-trapping than CO_2, but is fairly short-lived in the atmosphere, breaking down into CO_2 and water after about 12 years.

In broad terms, achieving net zero CO_2 emissions worldwide would stabilize CO_2 levels and global temperature increase. Achieving net zero *GHG emissions* is the object of the Paris Agreement, and would be associated with a slow decline in global average temperature. CO_2 removals (natural or technological) also have to compensate for these other GHGs, as there are no removal options for them.[9]

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7 4C Project, *Climate-Carbon Interactions in the 21st Century, 4C Outlook*, December 2020, https://4c-carbon.eu/resources/carbon-outlooks.

8 We are in overshoot in other dimensions of resource use and pollution as well, and too narrow a focus on carbon may obscure these other issues, which return when we consider nature-based solutions.

9 J. Rogelj et al., "Net-zero emissions targets are vague: three ways to fix", *Nature*, Vol 591, 18 March 2021, pp 365–8, https://www.nature.com/articles/d41586-021-00662-3.

Negative emissions have been a standard feature of climate change models on emissions pathways that keep long-run global temperature increase to 1.5 or 2°C above pre-industrial levels.[10] Figure 1 illustrates this dynamic in which climate models need negative emissions in the second half of the 21st century to stay within critical temperature thresholds. Put another way, net zero in 2050 is not so much the destination but a point on a pathway to net-negative emissions that are required after 2050.[11]

The standard fiction of negative emissions is bioenergy with carbon capture and storage (BECCS)—essentially growing trees and burning them for energy but capturing the CO_2 and injecting it below ground where it will stay forever. Climate models assume that technology for such exists at scale and at reasonable cost after 2050, but as climate scientists Kevin Anderson and Glen Peters comment, "the scale of biomass assumed in [integrated assessment models]—typically, one to two times the area of India—raises profound questions about carbon neutrality, land availability, competition with food production, and competing demands for bioenergy from the transport, heating, and industrial sectors."[12]

Figure 1 illustrates one possible net zero scenario. It shows historical GHG emissions for the world up to 2020 (estimated) then a 5 per cent annual reduction in emissions to 2080 and flat emissions to 2100. Carbon removals begin in 2030 and ramp up to net zero in 2050 (removals in 2050 are equal to emissions) and continue to increase before flattening out. After 2050 the world is in a state of negative emissions as required in climate models. This is only one potential pathway. A slower decline in GHG emissions means a faster ramp-up of carbon removals in order to achieve net zero in 2050.

Industrial carbon removals

While clearcutting an area one to two times the size of India every year for bioenergy is clearly problematic and unrealistic, the core idea of CCS, or carbon capture and storage[13]—without the bioenergy piece—has long been touted by the fossil fuel industry as a climate solution. Typically, carbon capture occurs at the site of a large point-source emitter (such as a fossil-fuel powered electricity plant or an oil refinery), with CO_2 then pumped deep underground.[14]

The reality of CCS so far has been different than the vision advanced by proponents. CCS is not a closed loop: while up to 90 per cent of CO_2 could be captured in a best-case scenario, actual numbers in the Canadian context are likely to be less. Capturing the CO_2 also costs around 20–25 per cent of the energy in a power plant because it lowers the plant's capacity.[15] More energy is required to liquefy the CO_2, build pipelines, drill

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10 UN Environment Programme and CICERO, *Pathways to Paris: A practical guide to climate transition scenarios for financial professionals*, 2021, https://www.unepfi.org/publications/banking-publications/pathways-to-paris/.

11 Typically, we are talking about net zero for all GHG emissions, not just CO_2, but we must read the fine print on pledges. Non-CO_2 GHGs are converted using 100-year global warming potentials. While there are plausible ways of removing CO_2, this is not true for other GHGs, so CO_2 removals after 2050 must also remove the equivalent emissions from other GHGs as well.

12 K. Anderson and G. Peters, "The trouble with negative emissions," *Science*, 14 October 2016, Vol. 354, Issue 6309, pp. 182-183, DOI: 10.1126/science.aah4567, https://science.sciencemag.org/content/354/6309/182.

13 Also referred to as carbon capture, utilization and storage (CCUS) to emphasize the use of captured CO_2. I use CCS in this same broad sense.

14 Not all of the CO_2 can be captured, however, so even in the best-case scenario 90 per cent is captured, likely less.

15 Intergovernmental Panel on Climate Change, *Special Report on Carbon Capture and Storage*, 2005, https://www.ipcc.ch/report/carbon-dioxide-capture-and-storage/.

injection wells and so forth. Sequestering 1 billion tonnes of CO_2 (one-fortieth of global CO_2 emissions) is estimated to require pipeline infrastructure equivalent to all existing petroleum pipelines.[16] Moreover, in CCS projects to date, more than 80 per cent of CO_2 captured has been used to re-pressurize old wells to get out more oil, rather than just storing excess CO_2.[17]

CCS is costly and would likely require substantial public subsidies. For example, Alberta is asking the federal government for $30 billion in subsidies over the coming decade to invest in CCS.[18] The federal government already contributed $240 million to the $1.5 billion Boundary Dam CCS project in Saskatchewan, which has been plagued by cost over-runs and downtime for repairs.[19] If CCS is going to be a significant part of Canada's climate strategy we must ask, what are the opportunity costs of such public investments? Public funds would be better spent on renewables and other climate action measures, while leaving the fossil fuels in the ground and avoiding further lock-in to fossil fuel infrastructure.

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Rather than provide public subsidies, government should mandate CCS for any new oil and gas projects, with all current projects required to be in compliance by 2030. Such a move would have to be backstopped by substantial measuring, monitoring and enforcement regulations, but would make the industry put its money where its mouth is. This could also include CCS requirements for "blue" hydrogen (that is, hydrogen made from fossil fuels with CCS) in Canada's developing hydrogen strategy.

Industrial carbon removals also include prospective future negative emissions technologies. Direct air capture (DAC) of carbon is the holy grail of such efforts. Because CO_2 is dispersed very thinly through the atmosphere, it requires a lot of electricity to power fans and a chemical sorbent to capture it. A second stage of the DAC process uses natural gas to heat the captured material to release the CO_2 so it can then be used elsewhere or piped underground.

Carbon Engineering, based in Squamish, BC, has been widely praised and has become a partner with several major oil and gas companies, but the DAC technology is, in the words of Michael Barnard, less a magic bullet and more a lead balloon.[20] So far, Carbon Engineering's solution is expensive per tonne captured and still uses a lot of fossil fuels to power its processes. In BC, electricity is very low-carbon, but in Alberta or another place

16 J. Sekera and A. Lichtenberger, "Assessing Carbon Capture: Public Policy, Science, and Societal Need: A Review of the Literature on Industrial Carbon Removal," *Biophysical Economics and Sustainability*, 2020, Volume 5, Article number: 14, https://link.springer.com/article/10.1007/s41247-020-00080-5.

17 Tyndall Centre, *A Review of the Role of Fossil Fuel-Based Carbon Capture and Storage in the Energy System*, January 2021, commissioned by Friends of the Earth Scotland, https://foe.scot/resource/report-carbon-capture-storage-energy-role/.

18 K. Cryderman and E. Graney, "Alberta seeks billions in federal funding for carbon capture projects," *The Globe and Mail*, 7 March 2021, https://www.theglobeandmail.com/business/article-alberta-seeks-billions-in-federal-funding-for-carbon-capture-projects/.

19 D.C. Fraser, "Sask. not moving forward on carbon capture expansion" in *Regina Leader-Post*, July 10, 2018, https://leaderpost.com/news/saskatchewan/sask-not-moving-forward-on-carbon-capture-expansion.

20 M. Barnard, "Chevron's Fig Leaf Part 1: Carbon Engineering Burns Natural Gas To Capture Carbon From the Air," *Clean Technica*, 12 April 2019, https://cleantechnica.com/2019/04/12/chevrons-fig-leaf-part-1-carbon-engineering-burns-natural-gas-to-capture-carbon-from-the-air/.

where electricity comes largely from fossil fuels, DAC is not likely to capture more CO_2 than it uses on a life-cycle basis (when all inputs to production are considered). Moreover, scaling up this technology would require large amounts of land and equipment, as well as proximity to geological storage.

A literature review of 200 published research papers looking at the biophysical requirements for CCS and DAC found both to be *carbon additive*. That is, when viewed over the whole life cycle these technologies produce more carbon emissions than they remove (except in a handful of rare circumstances). The authors also find that deploying these technologies at a climate-significant scale would require vast amounts of land, energy, and financial resources. Quality and quantity issues associated with the storage of the carbon to be removed include storage permanence and leakage, groundwater contamination and earthquakes. They argue that the market orientation of conversations around carbon removals is itself problematic, and advise against public subsidies, concluding that "governments should approach atmospheric CO_2 reduction as a public service like water treatment or waste disposal."[21]

It's impossible to know what carbon removal technologies of the future could achieve. For now, they are a dangerous distraction that diverts resources away from bona fide solutions. Scaling these ideas is very expensive and impractical, while perpetuating the era of fossil fuels prolongs other costly adverse impacts on human health, such as those due to air pollution.

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Current federal modelling towards Canada's 2030 target does not include engineered techno-fixes like CCS and DAC, but the door has been left open as policy-makers start to contemplate getting to 2050. A recent report from the Canadian Institute of Climate Choices models 60 scenarios towards net zero under a wide range of future conditions.[22] It finds that continued fossil fuel use can only happen in the face of large carbon removals, which could potentially account for as much as two-thirds of the way to net zero in 2050. However, this is predicated on highly uncertain carbon removal "wild cards" becoming cost-effective and scalable. In the short- to medium-term, the report recommends policy-makers focus attention on the more well-understood "safe bets" that reduce Canada's fossil fuel emissions in buildings, transportation and industry. The report concludes:

> [E]ngineered negative emissions solutions present a seductive but risky possibility of incumbents being able to continue their current approach…and the structure of the economy remaining mostly unchanged. But the risk is that if this system fails to come together as planned, it would create delays in emissions reductions and structural changes, significantly increasing the costs of Canada reaching its target.[23]

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21 J. Sekera and A. Lichtenberger, "Assessing Carbon Capture: Public Policy, Science, and Societal Need"

22 Canadian Institute of Climate Choices, *Canada's Net Zero Future*, February 2021, https://climatechoices.ca/reports/canadas-net-zero-future/.

23 Canadian Institute of Climate Choices, *Canada's Net Zero Future.*

Carbon accounting and Canada's forests

Canada has long sought credit in international negotiations for carbon storage in its forests. Canada helped negotiate the inclusion in the Kyoto Protocol of *managed* forests, which includes logging/forestry lands as well as parks (about 65 per cent of forest lands are managed forests). The federal government assumed that carbon sequestration in forests would represent about 20 per cent of Canada's emissions reduction towards its modest Kyoto Protocol target.[24]

A danger of this approach is that it can reduce the diversity of nature to a matter of carbon accounting based on computer modelling, as such emission reductions cannot be directly measured. Ironically, the one key strategy that could underpin such an approach—the conservation of intact, old-growth forest—has largely been ignored in favour of management approaches on lands used for forestry.[25]

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Prior to stating a new GHG target in April 2021, the federal government claimed its December 2020 climate action measures would put the country on a pathway to exceed its previous 2030 emission reduction target of 30 per cent below 2005 levels.[26] However, the federal government is claiming toward that target 17 million tonnes (Mt) of CO_2 reductions from Canada's managed forests. In addition to this amount are a promised 2 billion trees to be planted, other nature-based solutions and lower emissions from fertilizer use in agriculture, which will all contribute another 10 Mt of reductions for 2030.[27] Combined, these items comprise 12 per cent of Canada's anticipated drop in emissions, from 730 Mt in 2005 to 503 Mt in 2030, an amount that tips the scales from Canada meeting to not meeting its 2030 target.[28]

The harsh reality is, as Figure 2 shows, those managed forest lands have not been the reported carbon sink (in green), but rather a huge net source of carbon emissions (in blue) over the past couple decades.[29] This is largely the result of forest fires and insect infestations that have devastated the land base leading to a large net flux of CO_2.

Before 2000 Canada's managed forests were arguably a carbon sink, whether or not this should have been given credit in Kyoto. Unfortunately, Canada is now making the same point by engaging in some dodgy

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24 D. Spittlehouse, "Carbon credits."

25 S. Luyssaert et al., "Old-growth forests as global carbon sinks," *Nature*, October 2008, 455(7210):213-5, https://www.researchgate.net/publication/23250353_Old-growth_forests_as_global_carbon_sinks.

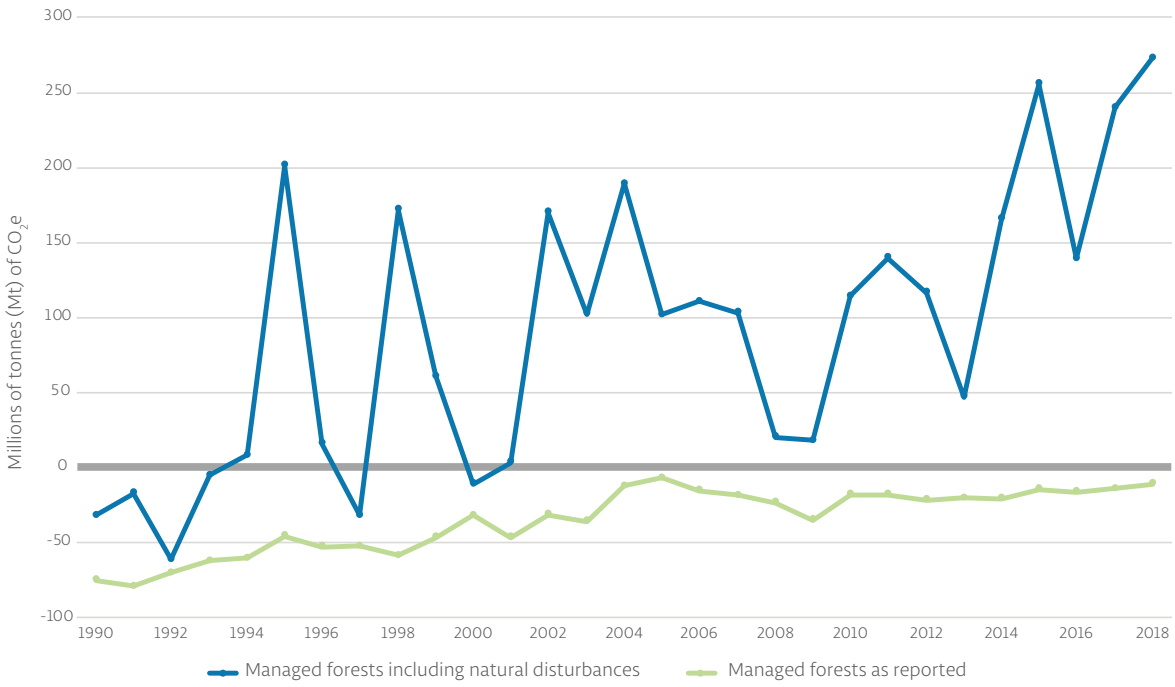
26 Government of Canada, *A Healthy Environment and a Healthy Economy, 2020*, https://www.canada.ca/content/dam/eccc/documents/pdf/climate-change/climate-plan/healthy_environment_healthy_economy_plan.pdf. The new 2030 GHG target is 40–45 per cent below 2005 levels.

27 Government of Canada, *Annex: Modelling and analysis of A Healthy Environment and a Healthy Economy*, 2020, https://www.canada.ca/content/dam/eccc/documents/pdf/climate-change/climate-plan/annex_modelling_analysis_healthy_environment_healthy_economy.pdf.

28 There are other reasons to be skeptical of federal government claims and modelling. See Lee and Mertins-Kirkwood, "New federal climate plan hindered by commitment to fossil fuel production," Policy Note, 15 December 2021, https://www.policynote.ca/new-climate-plan/.

29 Hat tip to some incredible investigative work by Barry Saxifrage on this topic, https://www.nationalobserver.com/2020/11/02/opinion/CO2-forestry-Canada-climate-threat-CO2.

Figure 2: Net CO_2 emissions from Canada's managed forests



Note: Points above zero are CO_2 emissions, points below are CO_2 removals.

Source: Environment and Climate Change Canada, Forest Land Remaining Forest Land Areas, GHG Fluxes and C Transfers, All Years (data for Tables 6–1 and 6–5 in 2020 *National Inventory Report*), received via special request.

accounting that ignores the full exchange of carbon between the atmosphere and Canada's forest land base. In 2017, Canada removed lands affected by insects and fires from its count. About one-quarter of Canada's managed forest lands have been uncounted in recent years, although when they become ready for commercial logging, they will be counted once again.

According to the federal government, this gives a better sense of the impact of human management of those forest lands, as opposed to the effects of natural disturbances.[30] But these "natural disturbances" are not "acts of God"; they are large macro events linked to climate change and rising temperatures. They should not be edited out to create a gerrymandered subset of Canada's forests that are purportedly increasing carbon storage.

The net carbon balance in Figure 2 is also a story about logging, as in recent years the logging industry has been cutting more than Canada's managed forests are growing back. This has also been masked by an accounting change made in 2017 that pushes forward in time the emissions that come from forests while they are stored in wood products. This has the effect of lowering emissions in the present compared to the previous assumption of instant oxidization. But it also puts carbon emissions on the books for 2050 that must be addressed in net zero planning.

30 See Chapter 6 in Government of Canada's National Inventory Report, starting in 2017 and thereafter. http://www.publications.gc.ca/site/eng/9.506002/publication.html.

For forests and other nature-based solutions, accounting methodologies can be twisted to come up with a more convenient result in the eyes of the government. There is much potential for this situation to get worse: in BC, for example, there is a plan to cut Northern Boreal forest to make pellets for export to Japan as a "carbon neutral" fuel source (BC already exports pellets to Europe for this purpose).[31]

Forest carbon and fossil fuel carbon are very different and should be treated as such. Forest emissions/removals cannot be directly measured but instead must be estimated, which introduces methodological choices that can affect the final count. Second, it matters what happens to those trees: they could burn down, be killed by insects or be logged for wood a few decades hence. In other words, the promised emissions reduction may not be permanent. The UN Framework Convention on Climate Change reports: "the main drawback of LULUCF [Land Use, Land Use Change and Forests] activities is their potential reversibility and non-permanence of carbon stocks as a result of human activities, natural disturbances or a combination of the two with loss of carbon stocks and release of GHG into the atmosphere as a result."[32]

Forest carbon and offsets

All of the various uncertainties in the measurement of carbon sinks and sources point to the risks of banking on them for emissions reductions. This is important context for the current push to create a new federal GHG Offset Protocol, which is developing protocols in four areas to start: improved forest management, landfill methane management, enhanced soil organic carbon, and advanced refrigeration systems[33]—all areas that have been problematic in the past. These offsets will be available for purchase by large industrial polluters covered by the federal Output-Based Pricing System.[34]

> Global and local experience with carbon offset markets shows many complicated accounting methodologies that give a false sense that emissions are indeed being reduced elsewhere, and that are vulnerable to being gamed.

Since fossil fuel CO_2 is the major contributor to climate change, a true offset must take CO_2 from the atmosphere and put it back underground. Absorbing more CO_2 in forests can help overall efforts, but to get CO_2 levels down from 417 ppm (March 2021) to a habitable 350 ppm means those forests will be needed anyway—*in addition* to reducing fossil fuel emissions to near-zero.

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31 B. Parfitt, "Trees to pellets? Scarred by two previous resource industry boom and busts, pivotal decisions lie ahead for community of Fort Nelson," Policy Note, 17 February 2021, https://www.policynote.ca/wood-pellets/.

32 United Nations Framework Convention on Climate Change, Land Use, Land-Use Change and Forestry (LULUCF), accessed 15 February 2021, https://unfccc.int/topics/land-use/workstreams/land-use--land-use-change-and-forestry-lulucf.

33 Government of Canada, Canada Gazette, Part I, Volume 155, Number 10: Greenhouse Gas Offset Credit System Regulations (Canada), 6 March 2021, https://canadagazette.gc.ca/rp-pr/p%02%021-03-06/html/reg1-eng.html.

34 Government of Canada, "Output-Based Pricing System," accessed March 20, 2021, https://www.canada.ca/en/environment-climate-change/services/climate-change/pricing-pollution-how-it-will-work/output-based-pricing-system.html.

In order to create a wider scope and a market for offsets, the definition has been broadened to include measures that prevent future emissions that would otherwise have occurred. This requires that a hypothetical baseline for "business-as-usual" be calculated and raises issues of measurement and verification to determine whether an offset would not have otherwise happened (called additionality). Global and local experience with carbon offset markets shows many complicated accounting methodologies that give a false sense that emissions are indeed being reduced elsewhere, and that are vulnerable to being gamed. They are not necessarily additional to what otherwise would have occurred, and in some cases are outright fraudulent.[35]

In BC, a scathing 2013 report from the auditor general raised concerns that BC's offsets, purchased to achieve "Carbon Neutral Government," did not represent real reductions in emissions elsewhere.[36] In one case, the Darkwoods project, a hypothetical "baseline" situation where a forest would have been clear cut, was claimed, with the value of that carbon monetized and sold to the government as offsets.[37] To make such avoided deforestation into an offset is to say that yesterday we had an emitter and a forest, and tomorrow we have an emitter and a forest, but that emitter is now carbon neutral because we did not liquidate the forest.

Conserving forests and ecosystems has other benefits, but should not give us extra credit in the form of reduced obligations for lowering fossil fuel emissions. Indeed, there's a strong case to be made for protecting intact forests and other natural areas that hold carbon, and, where possible, converting lands back into forests. This intersects with conservation, land issues and Indigenous rights, so it's more than just narrow carbon accounting at play. This important conservation work should continue to be funded, but should be engaged as a global public service, in light of Canada's huge land base and relatively small population, not as a market.

Offset programs are at best a temporary measure that achieves other social and environmental purposes; at worst, they represent a diversion that slows the real action we need to reduce fossil-fuel emissions.

Offsets for other nature-based solutions and agriculture are beset by similar measurement and verification problems: they are estimated, not measured, emissions reductions; and due to climate change they may not be permanent. Such projects may not be appropriate for other reasons if they reinforce a large corporate export-oriented agricultural model, including heavy fertilizer and pesticide use on monocrops. Alberta's auditor general has looked critically at offsets in agriculture for "conservation cropping"—which purportedly "increases emissions storage in the soil and leads to reduced fuel usage compared to conventional farming practices"—and was not assured they were valid.[38] Since 2007, some 14 million offset credits have been issued

35 B. Elgin, "These Trees Are Not What They Seem," Bloomberg Green, 9 December 2020, https://www.bloomberg.com/features/2020-nature-conservancy-carbon-offsets-trees/.

36 Auditor General of British Columbia, *An Audit of Carbon Neutral Government*, 26 March 2013, http://www.bcauditor.com/pubs/2013/report14/audit-carbon-neutral-government.

37 B. Parfitt, "Darkwoods, the murky world of carbon credits and a "carbon neutral" B.C. government," 15 July 2011, https://www.policynote.ca/darkwoods-the-murky-world-of-carbon-credits-and-a-%e2%80%9ccarbon-neutral%e2%80%9d-b-c-government/.

38 Auditor General of Alberta, *Regulating Large Industrial Facilities: Followup*, November 2020, https://www.oag.ab.ca/wp-content/uploads/2020/12/oag-environment-regulating-large-industrial-facilities-followup-nov-2020.pdf.

for that purpose. The federal government stated in fall 2020 that it would allow these Alberta offsets to be used in the new federal system.[39]

Offsets can also be used to finance other mitigation measures with dubious benefits. BC's auditor general was also critical of offset funds that went to oil and gas company Encana (now named Ovintiv), supposedly for technical improvements in its practices that reduced some of its emissions. Other BC offset projects include energy efficiency improvements at the Whistler Resort and Spa and the Sun Peaks Resort. In these and other cases it is hard to prove that these companies are not gaming the system to their advantage for projects already in the works. In many cases, these upgrades could simply have been regulated into being rather than subsidized by government.

As one of the compliance pathways, offsets serve to dilute the carbon price signal faced by large industrial emitters, reducing their willingness to invest in zero-carbon technologies. These large industrial emitters already get a pass on most of the carbon tax, paying it only on emissions above a certain threshold, a measure brought in to protect "competitiveness." Reining in industrial emissions continues to be Canada's weakest area of action, with most of the climate action effort focused on buildings and personal transportation.

To meet our Paris obligations, we need to stop burning fossil fuels *and* we need to engage in forest conservation and better forest management practices to suck up that excess atmospheric carbon. To this end, offset programs are at best a temporary measure that achieves other social and environmental purposes; at worst, they represent a diversion that slows the real action we need to reduce fossil-fuel emissions. If permitted, hard caps on the number of credits should be stated—at an aggregate level, nationally, but also at the level of individual companies—and their duration should be limited to a 10- to 20-year transition period.[40]

Purchasing carbon credits (ITMOs)

If we take all of the above—CCS, DAC, forest carbon and nature-based solutions—and turn it into a global market for buying and selling carbon credits, we can find a final escape hatch for federal and provincial governments. When the Pan Canadian Framework was developed in 2016, it was anticipated that both Ontario and Quebec would buy credits from California as part of the Western Climate Initiative (WCI) cap-and-trade system.[41] Ontario has since pulled out of the WCI, but Quebec remains within (and BC is technically a member but is not participating in the cap-and-trade system).

A low bar on internationally traded offsets is good for the business of generating credits but will undermine the broader collective action needed to get to net zero global emissions. The previous UN-sponsored carbon market, the Clean Development Mechanism (CDM), has been widely criticized for allowing carbon credits that did not represent bona fide additional emissions reductions. A 2016 review by the German Öko-Institut for

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39 A. Harvie, "Alberta carbon offsets can be used in federal system," Legal Update, Norton Rose Fulbright, 27 October 2020, https://www.nortonrosefulbright.com/en-ca/knowledge/publications/e7d79fd7/alberta-carbon-offsets-can-be-used-in-federal-system.

40 This *Globe and Mail* article suggests they could be capped at 8 per cent (same as Québec in the WCI) for industrial emitters in the Output-Based Pricing System, https://www.theglobeandmail.com/business/commentary/article-can-ottawa-build-a-carbon-offsets-market-without-greenwashing/?s=03.

41 Canadian Intergovernmental Conference Secretariat, Pan-Canadian Framework on Clean Growth and Climate Change, 2016, https://scics.ca/en/product-produit/pan-canadian-framework-on-clean-growth-and-climate-change/.

the EU found that the CDM "has fundamental flaws in terms of overall environmental integrity" with 85 per cent of the projects covered in this analysis and 73 per cent of the potential 2013–2020 Certified Emissions Reduction (CER) supply have a low likelihood that emission reductions are additional and are not over-estimated. Only 2 per cent of the projects and 7 per cent of potential CER supply have a high likelihood of ensuring that emission reductions are additional and are not over-estimated.[42]

Nonetheless, the Paris Agreement (Article 6) is developing new carbon trading rules to replace the CDM, whose mandate expired at the end of 2020.[43] The Taskforce on Scaling Voluntary Carbon Markets, a private sector-led initiative led by Mark Carney (former Governor of the Bank of England, the Bank of Canada and perhaps most importantly, former senior executive at investment firm Goldman Sachs) is calling for a 15-fold expansion of carbon markets towards meeting the Paris Agreement. In their view, by 2030, two billion tonnes (Gt)—equivalent to one-tenth of the needed global emissions reductions of 23 Gt CO_2 —could come from various forms of "sequestration and removal."[44]

The Government of Canada recently published draft principles to govern carbon credits/offsets, what the Paris Agreement calls internationally traded mitigation opportunities (ITMOs). The federal government has not yet decided whether it will use ITMOs or not, and if so, how much of Canada's target would be met by ITMOs. The government has said it will not support the use of old CDM offsets in the new system nor pre-2021 credits from voluntary offset markets.

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At this point, policy-makers seem enamored of the idea of carbon markets but have not grasped the challenges in making a functioning market, or whether a market is a suitable approach to frame mitigation activities in the first place. In a global market for carbon credits it would be very difficult to achieve integrity in ITMOs due to information asymmetries: only the supplier of the credit knows whether the project is truly additional, while other parties have a perverse incentive to make a deal.

Another key challenge is that there is no carbon budget that would determine quantities upon which to properly base prices. Instead, parties to the Paris Agreement table voluntary targets for specific years into the future, but then would engage in trading to meet their targets. This could mean that Canada has less incentive to reduce domestic emissions to the extent that it relies on ITMOs. It could also mean a decreased incentive to table stronger targets: why improve our target when we could do better and sell the credits?

It is also implicitly assumed that it will be rich corporations or governments who will be buying credits from lower-income countries of the Global South. This has led to concerns about the impact of projects on local,

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42 Öko-Institut, *How additional is the Clean Development Mechanism?*, March 2016, https://ec.europa.eu/clima/sites/clima/files/ets/docs/clean_dev_mechanism_en.pdf.

43 C. Farand, "UN-led carbon market suspends formal project registration after 2020," *Climate Home News*, 15 December 2020, https://www.climatechangenews.com/2020/12/15/un-led-carbon-market-suspends-formal-project-registration-2020/.

44 Taskforce on Scaling Voluntary Carbon Markets, *Final Report*, 27 January 2021, https://www.iif.com/tsvcm.

often Indigenous, people's access to land and resources and the excessive focus on carbon accounting over intact natural ecosystems and other dimensions of sustainability.[45] On the other hand, under the current discussion, Canadian corporations and other organizations could be sellers of ITMOs as well as governments. This could undermine Canada's ability to achieve its domestic emissions reduction targets if large corporations were allowed to sell credits on the global offset market.

Conclusion: Real zero, not net zero

Canada has been upping its game on climate, starting with the 2016 Pan-Canadian Framework on Clean Growth and Climate Change and new federal actions tabled at the end of 2020. However, far more clarity from the federal government is needed on how much they are betting on carbon removals for meeting 2050 net zero targets. A net zero target means less incentive to get to "real zero" emissions from fossil fuels, an escape hatch that perpetuates business as usual and delays more meaningful climate action.

Based on the carbon coming out of Canadian soil that ends up in the atmosphere, Canada's contribution to global warming is double than just looking at emissions released within Canada's borders.[46] Nonetheless, the emissions from getting fossil fuels out of the ground and to market are a significant part of Canada's emissions profile, around one-quarter of the total. Meeting Canada's net zero target for 2050 ultimately requires absolute reductions in production, but the federal government generally assumes that the level of Canadian exports will be determined by external demand in our export markets not by domestic policy.

A net zero target means less incentive to get to "real zero" emissions from fossil fuels, an escape hatch that perpetuates business as usual and delays more meaningful climate action.

Canada has been looking to Asia to diversify its export markets, and this is the key impetus behind the Trans Mountain pipeline expansion and LNG Canada. The very places to which Canada is seeking to increase fossil-fuel exports are now planning to scale back their consumption. In its refusal to confront these contradictions, Canada risks investing billions in new infrastructure (the Trans Mountain Pipeline Expansion) for a market that is soon disappearing. This is a moral failure: by looking the other way on fossil-fuel exports, Canada is simultaneously betting against the world getting its collective act together on climate.

In all of the above, the fundamental market framing of getting to net zero emissions is problematic, including a preference for carbon pricing and subsidies over regulation and bans, or the trading of emissions reductions. Negative emissions, whether through nature or technology, should be rethought as a public service to help solve a global collective action problem. Indeed, even as climate change has been called "the greatest market

45 Friends of the Earth International, *Chasing Carbon Unicorns: The deception of carbon markets and "net zero,"* 2021, https://www.foei.org/wp-content/uploads/2021/02/Friends-of-the-earth-international-carbon-unicorns-english.pdf.

46 M. Lee, "Extracted carbon and Canada's international trade in fossil fuels," *Studies in Political Economy*, vol 99 (2), 29 October 2018, https://www.tandfonline.com/doi/abs/10.1080/07078552.2018.1492214.

failure the world has seen" by economist Nicholas Stern,[47] policy-makers seem enamoured with the idea that carbon markets are going to solve the problem.

KEY RECOMMENDATIONS

1. Plan to reduce domestic emissions to "real zero" and to phase out the extraction and production of fossil fuels for export.
2. Specify the total carbon budget Canada intends to claim between now and 2050, with a view towards minimizing total emissions, since different pathways may lead to very different emissions totals.
3. Put limits on offsets and carbon removals for meeting 2050 net zero targets. Cap as a percentage and with a time limit.
4. Be explicit about any fundamental industrial sectors where it is impossible to transition (as opposed to being challenging or more costly).
5. Fund conservation of intact forests and nature-based solutions recognizing their important carbon, biodiversity and other co-benefits *but* treat this as a global public service. They should not be counted towards the 2050 target.
6. Don't subsidize carbon capture and storage (CCS) with public funds. Require CCS for any proposed fossil fuel projects and phase in requirements for CCS in current projects.
7. Proceed with caution to support direct air capture (DAC) powered by renewables as a public service. DAC is likely to run up against siting and scale issues.
8. Reject international carbon markets and do not plan on meeting domestic GHG targets by buying credits from outside Canada.

47 A. Benjamin, "Stern: Climate change a 'market failure,'" *The Guardian*, 29 November 2007, https://www.theguardian.com/environment/2007/nov/29/climatechange.carbonemissions.

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