

International Climate Finance: a key role for nature-based solutions

Recommendation summary

Through the Paris Agreement, Canada and other developed countries pledged to continue efforts to mobilize climate finance, setting a collective goal of at least US\$100 billion per year to help developing countries adapt to climate change and undertake low-carbon development. So far, the bulk of Canada's funding has gone towards technological approaches to mitigation, such as clean energy and renewables, and adaptation measures that don't necessarily provide any mitigation benefits. To support climate mitigation and adaptation in developing countries, the Green Budget Coalition recommends that Canada:

1. Increase its contribution to international climate finance to at least \$2.9 billion annually, in line with our share of responsibility for anthropogenic CO₂ in the Earth's atmosphere.
2. Apply at least half for nature-based solutions (NBS; also known as natural climate solutions), which involve sequestering more CO₂ in natural ecosystems, especially forests, and avoiding emissions from loss and degradation of forest and other natural ecosystems.

NBS measures, helpful also within Canada, are cross-cutting, addressing both climate mitigation and adaptation, while effectively addressing biodiversity conservation and providing benefits to local communities and indigenous people. They thus help fulfill Canada's commitment under the Paris accord to provide financial resources that achieve a balance between adaptation and mitigation, while also helping developing countries with biodiversity conservation (Convention on Biological Diversity) and furthering U.N. Sustainable Development Goals. Here we outline why, how and where this should be done.

Why forest carbon is a much bigger part of the solution than people think

"The way emissions from the forestry sector are reported conveys a misleadingly small sense of forests' potential contribution to climate stability. Forests' share of total emissions is reported as a net number, which is derived by subtracting carbon removed by forest growth from the gross emissions caused by deforestation. This number masks the true potential of forests as a climate solution. Halting tropical deforestation while allowing damaged forests to recover—and, in so doing, maintaining forests' ability to pull carbon from the atmosphere into vegetation and soils—could secure an amount of carbon equivalent to almost one-third of current annual emissions from all sectors."

-- Frances Seymour & Jonah Busch in *Why Forests? Why Now? The Science, Economics and Politics of Tropical Forests and Climate Change*ⁱ

Rationale

Need for negative emissions

- All pathways that limit global warming to 1.5°C with limited or no overshoot project the use of carbon dioxide *removal* on the order of 100–1000 Gt (gigatonne) of CO₂ over the 21st centuryⁱⁱ. Most 2-degree scenarios also rely on negative emissions; many call for removing billions of tons of CO₂ per year by mid-centuryⁱⁱⁱ ^{iv}.
- Negative emissions technologies are decades from maturity – too long to wait.
- To avoid catastrophic climate change, aggressive reduction of fossil fuel emissions and negative emissions measures are *both* required. Reducing fossil fuel emissions must remain the priority for developed countries (and China). By contrast, developing countries have low fossil fuel emissions and many offer opportunities for negative emissions through nature-based solutions.

Nature-based solutions potential

- Natural climate solutions can help the world achieve 37 percent of the Paris Climate Agreement target through 2030^{1,v}, yet as of 2015 they were receiving only 2.8 percent of public climate financing^{vi}.

¹ A major study published in 2017 quantified 20 conservation, restoration, and improved land management pathways that increase carbon storage and/or avoid greenhouse gas emissions across global forests, wetlands, grasslands, and agricultural lands. In the analysis, the potential of NBS was significant even when constrained by food and fiber security and biodiversity conservation. It also assumed accelerated carbon emissions reductions.

- Half the potential cost-effective NBS mitigation entails negative emissions (additional carbon sequestration). *We have no other means now to generate negative emissions on this scale.*
- NBS improves climate resilience and adaptation, providing water filtration, flood buffering, soil health, biodiversity conservation, and other co-benefits. These are very important to local communities.
- On cost, NBS compares very well with other emissions abatement measures (Appendix, Table 1).

Prioritizing NBS actions

- **Forest climate mitigation options** offer over two-thirds of the cost-effective NBS needed to hold warming to below 2°C (Appendix, Figure 1).
- **Tropical forests** exceed temperate and boreal forests in their potential for sequestration;^v and tropical deforestation results in large greenhouse gas emissions (Appendix, Figure 2).³
- **Preventing deforestation and forest degradation** is more cost effective than reforestation and afforestation and yields greater benefits for biodiversity conservation.
- **Protecting primary forests** is a priority, as they:
 - store 30–70% more carbon than logged and degraded forests^{xii xiii xiv}
 - have very high biodiversity value^{xv}
 - are still being lost^{4 xvi}
- **Mangroves** are among the most carbon-rich of tropical forests; they also provide nurseries for juvenile fish, stabilize and protect shorelines from storm damage, prevent erosion, and filter pollutants.
- **Peatlands** represent large terrestrial carbon banks; conserving and restoring peatlands is a top priority.
- Among ecosystem restoration measures, **natural regeneration** is the most cost effective in increasing ecosystem services (carbon storage, soil attributes and biodiversity protection) compared with agroforestry, nucleation⁵, and reforestation with native or exotic species.^{xvii}
- **Reforestation** offers an opportunity for very large-scale climate mitigation, however **timing is everything**: current forest losses are effectively irreversible from a climate perspective. With every hectare of forest cleared, more carbon is released into the atmosphere and nature’s capacity to absorb carbon is reduced. Restoring the carbon stock of cleared forests requires a time scale measured in decades, while the time frame to avoid catastrophic climate change is measure in years.ⁱ Thus, reforestation is important and worthwhile but should not displace measures to curtail ecosystem loss.
- **Bottom line: Tropical forest protection is the most urgent NBS priority.**

Global forests

- Of the pre-agricultural global forest cover (estimated at 6.2 billion hectares):^{vii}
 - 30 percent has been cleared
 - 20 percent has been degraded
 - most of the rest has been fragmented
 - 15 percent remains intact
- Only 20% of the planet’s remaining forests are considered Intact Forest Landscapes^{2, viii}
- Over 2 billion ha of deforested and degraded land provide opportunities for forest landscape restoration around the world.^{ix}
- Forest ecosystems contain up to 80% of terrestrial biomass and provide habitat for over half of the known terrestrial plant and animal species.^{x, xi}

Measurement technologies: Technological advances give us the low-cost ability to monitor forest carbon change, improving the efficacy of results-based payment schemes like REDD+. In fact, the Canadian Forest Service is a world leader in modeling all forest carbon stocks required under the Kyoto Protocol and has developed user-friendly software that it provides for free. It has also been building capacity to use this tool in several developing countries.

² Intact forest landscapes cover at least 500 km² of forest with no remotely detected signs of human activity or habitat fragmentation.

³ Also, the increased absorption of solar energy (decreased albedo) of forests reduces the climate benefit of higher latitude and higher altitude forests but with tropical forests is more than offset by the cooling effects of massive evapotranspiration and cloud formation.

⁴ Intact forest has been reduced by 7.2% since 2000, with three times greater losses between 2011-2013 compared to 2000-2003^{xiv}

⁵ Nucleation refers to establishing small patches of vegetation on degraded land.

Adaptation

NBS is a cost-effective approach to further adaptation to the impacts of climate change. Coastal conservation and restoration is crucial for protecting coastal communities and infrastructure from higher sea levels and increased intensity of coastal storms. Forests, grasslands and wetlands all reduce flooding, hence targeted restoration is another priority along with protection. Tropical forests are crucial for cloud formation and their importance in the hydrological cycle becomes even more important to minimize droughts that are now more frequent. Agricultural systems also become more dependent on adjacent natural ecosystems to counter climate change effects. Connecting natural ecosystems through strategic restoration will allow for movement of pollinators and birds and bats that control insects. Integration of trees and natural ecosystems in agricultural lands improves soil and water conservation.

Human benefits

- **Local communities and indigenous people** are important partners and beneficiaries in conservation.
- Traditional indigenous territories encompass up to 22 percent of the world's land surface and hold 80 percent of the planet's biodiversity, according to a World Bank study^{xxix}, which included the comment that engaging indigenous peoples in biodiversity conservation represents a "win-win situation". In the Brazilian Amazon, Indigenous lands were found to be particularly effective at curbing high deforestation pressure, relative to both strictly protected and sustainable use areas^{xx}.
- **Sustainable Development Goals:** Some 240 million people live in forested regions, and in developing countries, forest-based activities provide about 30 million jobs in the informal sector, as well as up to one-third of all rural non-farm employment.^{xxi} On average, rural communities in and around forests derive more than one-fifth of household income from gathering wild forest products, such as fuelwood, food, and medicinal plants.ⁱ Forested watersheds supply water for irrigating agricultural crops, generating hydroelectric power, and providing clean drinking water and sanitation. Intact forest vegetation increases resilience to the impacts of extreme weather events such as landslides and coastal storm surges. Forests thus contribute to health and safety as well as to food and energy security. Forest NBS initiatives address many Sustainable Development Goals (1, 2, 3, 6, 8, 10, 12, 13, 15).

"Action to protect, enhance, or restore carbon stocks can improve habitat, reduce the risk of catastrophic wildfires, increase soil fertility and water-holding capacity, and decrease air and water pollution. In some places, the co-benefits of NCS may be more valuable than the carbon mitigation benefit."

-- Anderson et al. 2019^{xviii}

Biodiversity benefits

- The world is entering a sixth mass extinction, as evidenced by much higher extinction rates compared with normal "background" rates^{xxii}. This can still be largely or partially averted through intensified conservation efforts.
- Tropical ecosystems support most of the Earth's species and this is where nature is most under threat.
- **Canada's migratory birds:** Many of Canada's breeding birds spend more time in the Neotropics – Latin America including the Caribbean – than in Canada. Populations are undergoing a "steep decline" for 31 bird species wintering in South America^{xxiii}, where habitat loss is ongoing.
- Under the **Convention on Biological Diversity**, Canada committed to assisting developing countries with biodiversity conservation. Canada also committed to the UN Sustainable Development Goal 15, which pledges to protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss. Nature-based solutions represent effective action in fulfilling these commitments.

Canada's climate change commitments and where we stand

- Canada signed and ratified the 2015 Paris Climate Agreement with a commitment to reduce greenhouse gas emissions by 30% below 2005 levels by 2030.
- Article 9 of the Paris Agreement stipulates that “developed country Parties shall provide financial resources to assist developing country Parties with respect to both mitigation and adaptation in continuation of their existing obligations under the Convention”. The goal is US\$100 billion annually by 2020.
- Canada's share of cumulative (1751-2016) global CO₂ emissions is 2 percent, according to the Carbon Dioxide Information Analysis Centre. However, our “fair share” responsibility is estimated at 3-4%.^{xxiv}
- Public climate financing leverages private sector funds of about 38%.^{xxv} If this figure is applied to a figure of US\$3 billion (3%—Canada's fair share—of total commitment from developed countries) and a 0.75 exchange rate is applied, **Canada's minimum commitment should be \$2.9 billion (CAD) annually.**
- Canada committed C\$2.65 billion for the period 2015-2020 to and has indicated that its contribution will scale up to C\$800 million per year by 2020, a number substantially below our fair share.
- Canada is also far behind other countries in providing international finance for forests (Appendix, Figure 3). As did Norway, Canada accumulated its wealth and contributed to global warming largely through emissions-intensive extractive industries. Canada would do well to follow Norway's example and compensate developing countries with results-based payments for forest conservation.

What and where

As we have tried to make clear, to optimize climate finance assistance for developing countries, Canada can simultaneously address biodiversity conservation and climate mitigation and adaptation through support for NBS measures. Immediate priorities are measures to:

- avoid tropical deforestation and the loss or degradation of coastal ecosystems and peatlands;
- allow degraded forests, peatlands, and coastal ecosystems to regenerate.

We believe Canada should focus on these two approaches in the short term. Longer term, reforestation and restoration offers the largest opportunity for negative carbon emissions. In total, twenty climate mitigation pathways are detailed in the Appendix to the “Natural Climate Solutions” study, including agriculture pathways (notably, Improving nutrient management in agriculture).

Accomplishing the two priority objectives could be done through bilateral agreements with developing countries to manage and protect existing protected areas, create new ones, reduce deforestation and degradation of natural ecosystems, and undertake ecological restoration. We should particularly reward countries currently prioritizing forest conservation, such as Colombia, Costa Rica, Ecuador, Peru and Indonesia. Brazil holds 60% of the Amazonian rainforest and is always important. The Guyanas (Suriname, French Guiana, and Guyana) are of special interest due to their importance for Canada's wintering shorebirds. Colombia is especially important for Canada's wintering songbirds. These countries also merit consideration as “high forest low deforestation” (HFLD) countries⁶.

Recommendations

- Canada should increase its international climate finance commitment, ideally to **\$2.9 billion (US\$2.2 billion) per year**, from 2020/2021 through 2025/2026.
- It is most important that Canada's climate finance spending entails *effective and timely* implementation (avoiding prolonged bureaucratic delays, as can happen with multilateral agencies).

⁶ High-forest low-deforestation (HFLD) countries are an overlooked option. These countries contain approximately 24% of the world's remaining forests and are custodians of diverse ecosystems, rich biodiversity and a large proportion of forest carbon. HFLD developing countries are receiving a very small portion of climate finance—less than 14% of all funds committed—and are “in dire need” of international climate finance, technology transfer and capacity building to achieve sustainable development goals and the goals of the Paris Agreement.

- Canada should designate **at least half** of its climate finance to nature-based solutions aimed primarily at (i) avoiding loss or degradation of tropical forests, peatlands and coastal ecosystems, and (ii) allowing these ecosystems to regenerate (with resulting negative emissions). These NBS pathways are a priority for several reasons: they are highly cost effective; the climate benefits are immediate; and the human and biodiversity benefits are large. Options for forest-related climate finance:
 - Bilateral agreements between Canada and select developing countries to apply needed funds to safeguard existing protected areas, create new ones, reduce deforestation and degradation of natural ecosystems and undertake ecological restoration. (Norway, Germany, and the U.K. have pledged billions in bilateral aid to combat tropical deforestation. Canada can similarly distinguish itself.)
 - Results based payments for REDD+⁷. REDD+ was enshrined in Article 5 of the 2015 Paris Agreement but has—despite its potential to mobilize public and private finance to maintain and enhance forest carbon sequestration—has been slowed due to the failure of developed countries to adequately finance it. Advances in measurement and monitoring technologies and some demonstrated success in countries like Brazil and Indonesia may turn this around.
 - Internationally Transferable Mitigation Outcomes (ITMOs), a mechanism for trading between countries, outlined in Article 6 of the Paris Agreement⁸
 - Canada could complement its conservation partnerships with Canada’s First Nations with support for conservation partnerships involving indigenous people in developing countries. This can provide large-scale carbon and biodiversity benefits at an exceptionally low cost.
 - Further contributions to the Green Climate Fund or Least Developed Countries Fund can be made if they are determined to be cost effective are able to be implemented without delay.
 - Assisting developing countries to build capacity to measure and monitor their forest emissions by using the Canadian Forest Service’s Carbon Budget Model software.
- **Resulting carbon benefit:** If Canada applied \$1.45 billion (half of \$2.9 billion) in climate finance to the recommended nature-based solutions at a cost of US\$5/t CO₂, the emissions reduction would be the equivalent of 30% of Canada’s total annual greenhouse gas emissions (Appendix, Table 2).
- There are various options for applying remaining climate finance, including the development of low-carbon energy and related infrastructure and climate change adaptation measures additional to NBS.

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⁷ Reducing emissions from deforestation and forest degradation and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries

⁸ While the rules of this are still being negotiated, much of the gap in Canada’s ambition could be met by collaborating with developing world countries to generate emissions reductions and removals from the land sector, with the investment coming from Canada, and Canada getting the emissions reductions as an “ITMO” in exchange. The host country would benefit from forest conservation and management finance, and a long- term bilateral deal with Canada. Canada would benefit from being able to meet the commitments in the Paris Agreement.

Appendix

Table 1. Static costs (in USD) of policies based on a compilation of economic studies^{xxvi}. These figures relate to the United States. With respect to NBS options, they only include only reforestation (highlighted), but costs for avoided deforestation are in the same range.

Policy	Estimate (2017\$/ton CO ₂ e)
Behavioral Energy Efficiency	-190
Corn starch ethanol (U.S.)	-18 – +310
Renewable Portfolio Standards	0-190
Reforestation	1-10
Wind Energy Subsidies	2-260
Clean Power Plan	11
Gasoline Tax	18-47
Methane Flaring Regulation	20
Reducing Federal Coal Leasing	33-68
CAFE Standards	48-310
Agricultural Emissions Policies	50-65
National Clean Energy Standard	51-110
Soil Management	57
Livestock Management Policies	71
Concentrating Solar Power Expansion (China & India)	100
Renewable Fuel Subsidies	100
Low Carbon Fuel Standard	100-2900
Solar PV Subsidies	140-2100
Biodiesel	150-420
Energy Efficiency Programs (China)	250-300
Cash for Clunkers	270-420
Weatherization Assistance Program	350
Dedicated Battery Electric Vehicle Subsidy	350-640

Figure 1. Mitigation potential by greenhouse gas, biome, and flux type.
From: Supporting Information Appendix, Natural climate solutions.^v

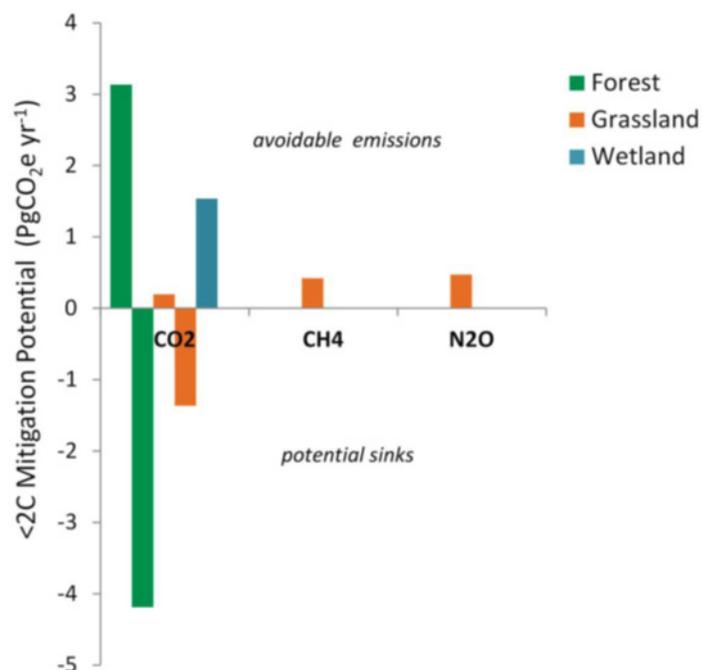
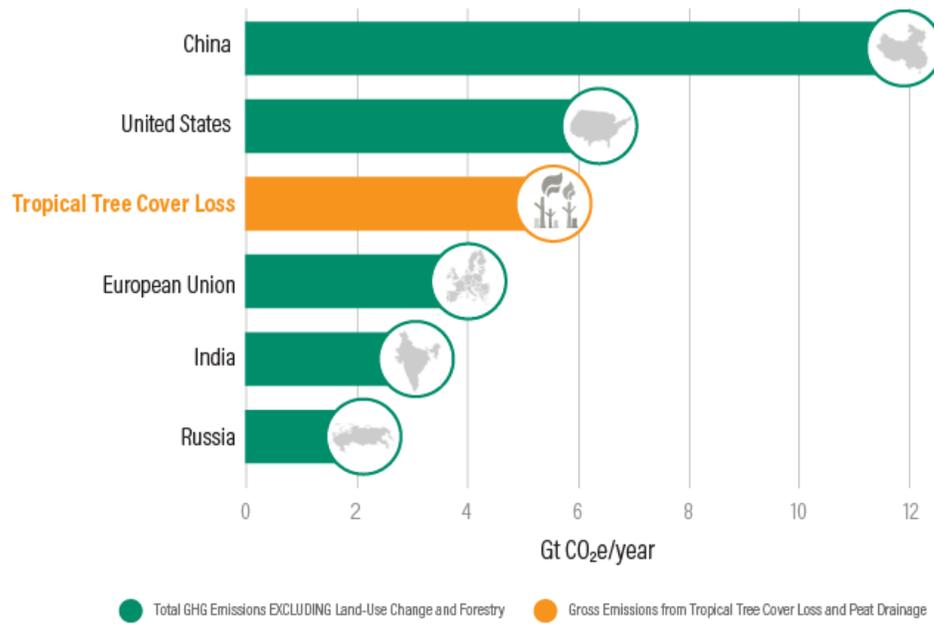


Figure 2

If Tropical Deforestation were a Country, it Would Rank Third in CO₂e Emissions



Source: Seymour & Busch, 2016.



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Figure 3. The state of REDD+ finance as of 2014.ⁱ

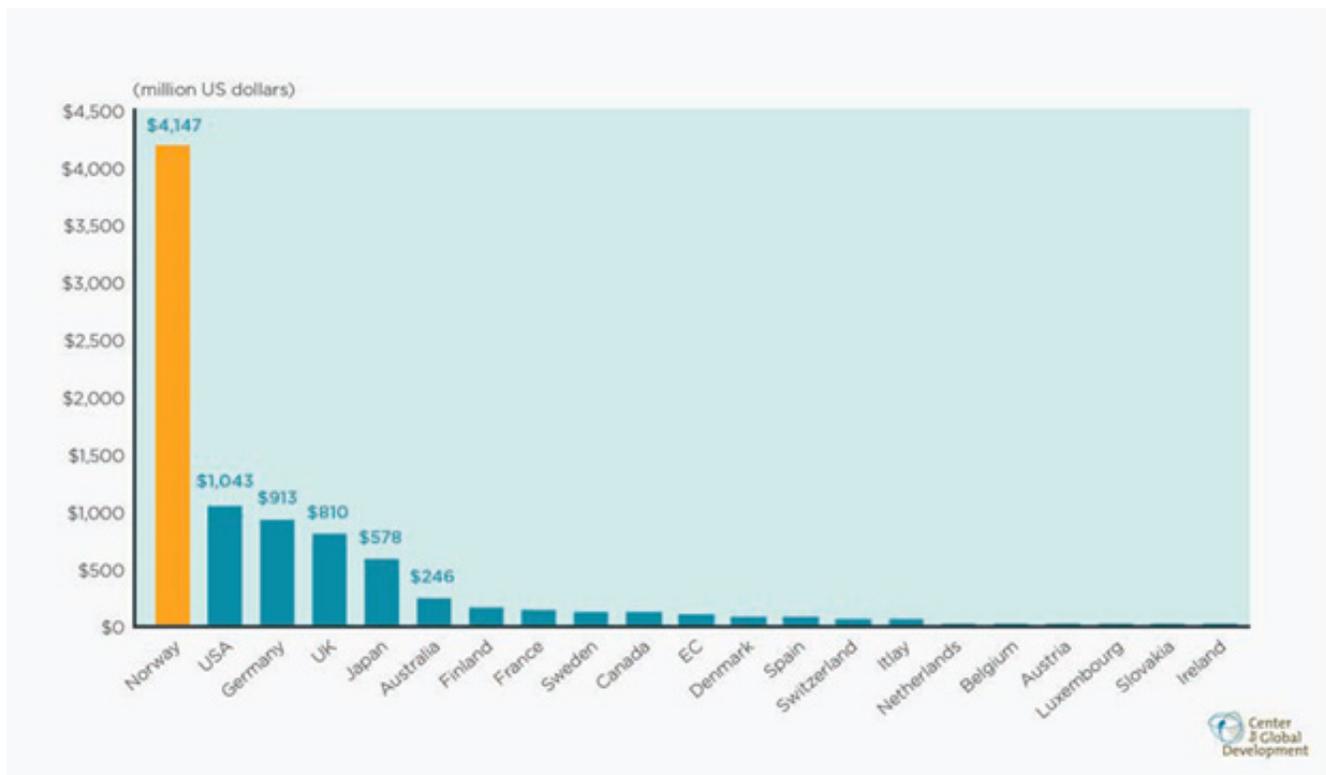


Table 2. Expected emissions benefits in relation to cost

The cost per tonne of CO₂ for avoided and negative emissions from our recommended NBS initiatives varies widely from less than a dollar to >\$100. There is ample opportunity to take advantage of low-cost (<US\$10) initiatives. Here are several scenarios:

<i>finance level (USD)</i>	<i>cost for avoided & negative emissions (USD)</i>	<i>total CO₂ emissions reduction*</i>	<i>percentage of Canada's GHG emissions (716 Mt CO₂e in 2017)</i>
\$400 million	\$5/tCO ₂	80 Mt	11
\$400 million	\$10/tCO ₂	40 Mt	6
\$1 billion	\$5/tCO ₂	200 Mt	28
\$1 billion	\$10/tCO ₂	100 Mt	14
\$1.087 billion*	\$5/tCO ₂	217 Mt	30
** Compare with:			
\$1.24 billion 2015 (?) to 2025 \$124 million (?) annualized	\$45/tCO ₂ (based on 10 years)	2.76 Mt CO ₂ e per year	0.4

* Half of Canada's "fair share" (taking account of 38% leveraging) for assisting developing countries with climate mitigation and adaptation if half is applied to nature-based solutions.

** For comparison, Alberta committed \$1.24 billion "through 2025" (start date not given) to two commercial-scale carbon capture and storage projects that will reduce the CO₂ emissions from the oil sands and fertilizer sectors.

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- ⁱⁱ IPCC, 2018. *Global Warming of 1.5°C*. <https://www.ipcc.ch/sr15/>
- ⁱⁱⁱ Elizabeth Kolbert in [Yale 360](#), (2018) *Climate Solutions: Is It Feasible to Remove Enough CO₂ from the Air?*
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