Nature-based Climate Solutions

7 must-knows for effective implementation

St. Francis Xavier University · Concordia · SDA · UVIC · SFU Simon Fraser University

Purpose

Nature-based climate solutions, or NbCS, are actions to preserve and enhance carbon storage in natural or managed ecosystems while providing environmental and social benefits to people and nature (1, 2). As a complement to decarbonization efforts, they can be an important climate mitigation option.

This guide suggests when to use Nature-based climate solutions and what to watch out for during implementation.

1) Note the difference

Nature-based climate solutions are fundamentally different from actions that reduce fossil fuel emissions

NbCS aim to increase the amount of carbon stored in natural ecosystems and consequently decrease the amount of carbon dioxide present in the atmosphere. Given that carbon moves naturally between ecosystems, the ocean and the atmosphere, NbCS represent a redistribution of carbon between these reservoirs, but not a permanent storage of carbon away from the atmosphere. In contrast, burning fossil fuels adds new carbon to the atmosphere-ocean-land system, which can be negated by returning carbon to permanent geological reservoirs or by avoiding those emissions at the source.

Key Message

Nature-based climate solutions are important but are not equal to avoiding fossil fuel emissions in the first place.

2) Reductions first!

Consider Nature-based climate solutions a support to meeting global climate targets

The potential of NbCS to reduce net greenhouse gas (GHG) emissions – including how much carbon can be stored, and for how long – is highly variable, and reflects the variation of the ecosystems where NbCS are implemented. In contrast, reducing emissions in sectors like energy or transport is a more effective strategy to address climate change, especially in Canada where these sectors account for more than half of national emissions (3).

Key Message

Stringent emissions reductions in all sectors must remain the priority, with NbCS implementation as a complementary strategy.

3) Be Aware!

Nature-based climate solutions help store carbon, but other unwanted climate impacts, like further warming, may occur

Sometimes, changes caused by implementing Nature-based solutions can have unintended consequences for the climate. For example, actions such as planting trees, can make an area darker, causing it to absorb more sunlight and actually raise temperatures, especially in snowy regions. Other examples, such as increasing vegetation through cover crops, can increase evapotranspiration, which in turn cools temperatures at the earth's surface. In some parts of the world, changes in land-use through forestation have been found to decrease both soil moisture and water availability. So, be aware that implementing Nature-based climate solutions can modify temperatures and the hydrologic cycle in unexpected ways (4, 5).

Key Message

The climate value of NbCS will vary depending on the type and location of action taken. This variation in effectiveness should be incorporated into decisions regarding implementation.

4) Embrace impermanence

Nature-based climate solutions implementation should factor in the temporary nature of carbon stored in ecosystems

As the climate warms, the intensity and frequency of droughts, fires, and floods increases, impacting the ecosystems where NbCS are being applied, and sometimes reducing their ability to absorb carbon. Indeed, there is a risk that successfully stored land carbon could be lost back to the atmosphere as a result of disturbances such as wildfire, deforestation or even invasive species. Transparently and explicitly accounting for temporary storage, especially within a voluntary carbon market, can help quantify and track the long term benefit of NbCS (6,7,8).

Key Message

NbCS cannot deliver permanent carbon storage. Carbon markets should be modified to measure and value the climate benefit of temporary storage.

5) We can't just plant trees!

Policy should include a broader suite of NbCS options, resulting in more effective climate mitigation and adaptation strategies

It's easy to forget that Nature-based climate solutions encompass a whole suite of interventions within an ecosystem. A good strategy is to "protect, manage and then restore lands" in that order of priority for most effective climate mitigation (9). Alongside forest protection and management, practicing NbCS in agricultural lands, grasslands, and peatlands have the greatest potential to reduce emissions over the next three decades (10). Wetland conservation is also a highly effective NbCS (11). Broadening the focus to include a wider range of Nature-based climate solutions will strengthen climate resilience and can deliver co-benefits for water, wildlife, and communities.

Key Message

Reforestation is important, but so is the preservation and management of existing carbon. Policy guidance and emissions targets should recognize the importance of avoided emissions from a broad range of Nature-based climate solutions.

6) A unique opportunity

Indigenous-led efforts for nature conservation and restoration can help advance climate and biodiversity targets grounded in Indigenous self-determination

Indigenous-led Nature-based solutions, deployed through efforts such as Indigenous Guardians programs and Indigenous Protected Conserved Areas, are as effective as existing Protected Areas in terms of climate change mitigation and biodiversity conservation (12). Indigenous-led NbCS, along with government support can result in combined biodiversity, climate, social, economic, and cultural outcomes, yet these outcomes can only be sustainable in the long-term through the recognition of Indigenous rights (13).

Key Message

Indigenous-led NbCS are effective at maintaining carbon stocks and avoiding emissions, and offer an opportunity to simultaneously advance climate and biodiversity policy and Indigenous sovereignty.

7) Prioritize Net-Zero

High-income countries, including Canada, exceed the global carbon budget. Nature-based climate solutions can help change this but only after reaching net-zero emissions first

The remaining carbon budget to limit global warming to 1.5°C is virtually exhausted – about four years left at the 2025 emissions levels (14). No single region can counterbalance others' excess emissions, and every additional ton of carbon dioxide emitted contributes to global budget overshoot (15). To effectively repay our global carbon debt, Canada must first reach net-zero national emissions, and then employ NbCS and other carbon removal actions to achieve net-negative emissions. If achieved, this net carbon removal from the atmosphere could compensate for unfairly high historical emissions.

Key Message

Net-zero emissions must be reached via stringent emissions reductions across all sectors before NbCS can be claimed as a contribution to repaying national carbon debt.

Contributors

Andrew MacDougall, Associate Professor, Earth and Environmental Science, St. Francis Xavier University

Kirsten Zickfeld, Distinguished SFU Professor of Climate Science, Simon Fraser University

Damon Matthews, Professor, Geography, Planning and Environment, Concordia University

Andrew Weaver, Professor, School of Earth and Ocean Sciences, University of Victoria

Jayakrishnan K U, Department of Geography, Simon Fraser University

Christine Leclerc, Simon Fraser University, Climate Research Lab

Pierre Etienne Banville, Simon Fraser University

Camilo Alejo Monroy, Geography, Planning and Environment, Concordia University

Design: Rachelle Fox, Future Earth Canada and Sustainability in the Digital Age

Editor: Andréa Ventimiglia Future Earth Canada and Sustainability in the Digital Age

Get in touch

Andrew MacDougall
Email: amacdoug@stfx.ca
Website: nbsclimate.ca

This project was undertaken with the financial support of the Government of Canada.

Ce projet a été réalisé avec l'appui financier du gouvernement du Canada.

Canada