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Editorial: Forest carbon credits as a nature-based solution to climate change?

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Editorial on the Research Topic
Forest carbon credits as a nature-based solution to climate change?

The Intergovernmental Panel on Climate Change Sixth Assessment Synthesis Report states the urgent need for sustained carbon emissions reductions at scale across all economic sectors to mitigate climate change and to keep global warming at the lower end of the temperature increase range (1.5–2°C) by the century's end (IPCC, 2023).

To achieve this ambitious climate goal, increasing international cooperation through carbon markets has been identified as a potentially cost-effective way to deliver fast, continued large-scale emissions reductions (Yu et al., 2021; Piris-Cabezas et al., 2023). In fact, compliance and voluntary carbon markets are growing worldwide, boosting supply of and demand for carbon credits from protecting, managing, and restoring forests. However, forest carbon crediting programs are still small in scale, and controversy continues, particularly for project-based credits used for offsetting, as to whether these actually benefit the climate [e.g., see the exchange between The Guardian (2023) and Verra (2023)].

Academic research and public policies are not keeping up with the lightning-speed developments in the markets for forest carbon credits. Market design, regulatory, governance, and implementation issues all need to be resolved to scale forest carbon credits as an efficient policy tool with high environmental integrity, which drives down net greenhouse gas emissions, enhances broad climate mitigation ambition, and fosters equitable and sustainable economic development.

In this Research Topic, our goal is to explore how forest carbon credits could be an effective nature-based solution to climate change and, at the same time, inform the debate with academic research to escape the current gridlock and, if possible, enable forest carbon crediting to play a more significant role in the sustainable management of forests.

Forest carbon credits could be generated from tropical, temperate, and boreal forests at various spatial scales—from projects to jurisdictions—and the credits could be retired or sold in voluntary or compliance markets. Supporters of forest carbon credits point to the urgent need to channel stronger financial incentives for avoided deforestation, improved forest management, land restoration, and better management of natural disturbances. They also point to a paucity of alternative effective mechanisms to drive the changes needed.

However, researchers, policymakers, market participants, and stakeholders often engage in contentious debates on issues (and their potential solutions) related but not limited to:

- Additionality—whether the activities that generate forest carbon credits (i.e., avoided deforestation, improved forest management, or restoration) have happened only because of the targeted economic incentives enabled by the ability to sell credits.
- Duration or Permanence—whether the generation of forest carbon credits and their use as offsets lead to long-term climate benefits.
- Leakage—whether the generation of forest carbon credits in one area leads to increased emissions elsewhere so that the net climate gains are reduced or converted to net losses.

Some proponents of forest carbon credits argue that additionality can be assessed with some confidence on large scales, that credits can be durable over the necessary timeframe to result in climate benefits, particularly with appropriate buffers and/or requirements for replacement, and that both duration and leakage can be better addressed on jurisdictional geographic scales.

We also need to enhance our understanding of the co-benefits of forest carbon crediting for coupled ecosystem services (e.g., biodiversity and water quality) and the impacts on social outcomes, such as improved employment, and on equity outcomes (e.g., indigenous people and local communities).

In this Research Topic, in order of publication date, theoretical and applied contributions to the forest carbon credits debate have been detailed.

Badgley et al. analyze the current performance of California's forest carbon credits buffer pool and conclude that it is currently undercapitalized to secure the 100-year permanence requirements for forest carbon projects.

Mei and Clutter conduct cost-benefit analyses for a representative landowner supplying forest carbon credits in voluntary carbon markets and run sensitivity tests for different interest rate, timber, and carbon prices.

Galik et al. present novel and emerging approaches to deal with the permanence of forest carbon credits in the United States, i.e., short-term, temporary carbon crediting, and they also conduct quantitative analysis of the net carbon flux of alternative carbon accounting methods and project configurations.

McCallister et al. use a machine learning algorithm to model the duration of emissions reductions under different jurisdictional policy interventions and policy rollbacks to avoid deforestation and promote restoration in the state of Mato Grosso, Brazil.

Nikolakis et al. examine the experience of one Indigenous people's fire management practice—savanna burning in Northern Australia—to reduce the risk of wildfires and be rewarded through carbon markets for avoided emissions. The authors provide guidance on how to transpose, adapt, and scale such initiatives to indigenous lands in temperate forests in the province of British Columbia, Canada.

Carver et al. analyze the effects of policies implemented in New Zealand's forestry sector, as part of the New Zealand Emissions Trading Scheme, on landowners' participation in emissions trading and on deforestation and reforestation outcomes over the 2008–2022 period.

Herbert et al. explain how Californian landowners can opt to participate in programs with competing forest management policy goals: one enables those who increase forest carbon stocks to generate credits for sale as offsets in the state's cap-and-trade system, while another is targeted at mitigating wildfire risks by reducing fuel loads, which may have the effect of reducing carbon stocks, particularly in the short term.

Chan et al. demonstrate that revenue insurance tools or buffer pools of forest carbon credits can mitigate the underperformance risk of jurisdictional REDD+,[1] potentially unlocking upfront capital to achieve emissions reductions at scale.

Haya et al. take stock of the current literature on the principal quality attributes a carbon crediting methodology for improved forest management should aspire to, discuss how main project-based forest carbon crediting methodologies fare relative to recommendations from academic research, and suggest pathways for improvements.

Areas where further academic research on forest carbon credits could inform improved policymaking include the setting of crediting baselines; duration-related concepts—risks of emissions reversals and appropriate scales for buffer pools or pricing of insurance against reversals; innovative ways to address duration and leakage; quantification methods for forest carbon stocks and fluxes and carbon content in wood-based products; measurement of forest-related scope 3 emissions in supply chains; transaction costs and ways to minimize them; and disentangling the effects of natural and human disturbances on forests.

The editors fully recognize that forest carbon credits are a complement to, not a substitute for, the deep decarbonization process that countries and companies must rapidly undertake to meet global commitments under the Paris Agreement. However, protecting and restoring forests are critical parts of any pathway that achieves global climate goals, and forest carbon credits could play an important role in motivating and funding those activities. The articles in this special topic help further our understanding of forest carbon credits as a tool to reach that goal.

Author contributions

BP wrote the first draft of the manuscript. GB, HZ, and SK commented and edited it. All authors approved the manuscript.

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1 REDD+ is Reducing Emissions from Deforestation and forest Degradation, plus the sustainable management of forests, and the conservation and enhancement of forest carbon stocks.

Conflict of interest

BP was employed by BP Consulting and Training LTDA and was an advisor for Environmental Defense Fund. SK was employed by Environmental Defense Fund.

The remaining authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

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