Weekly Summary

Economics of Climate Change

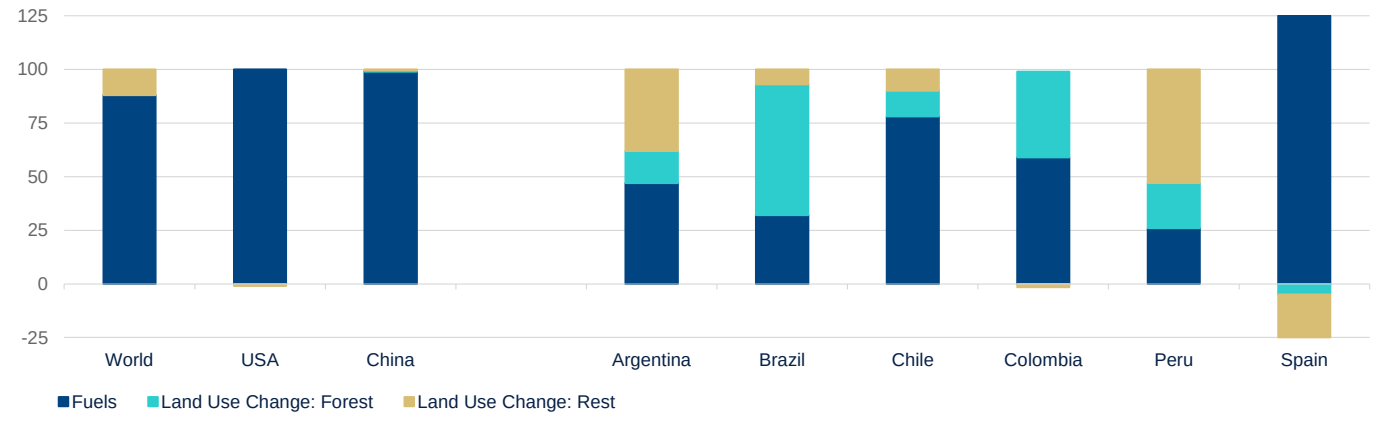
May 31, 2024

Carbon Markets to Turn Forests into Levers for Climate mitigation and Social Development

Carbon emissions from forest land use change, relevant in developing economies, could be reduced with the development of carbon markets, while contributing to social sustainability. Robust institutional frameworks, effective governance, and comprehensive policies are needed to foster the demand for a supply of carbon credits with high-quality standards.

Although fossil fuel combustion accounts for 90% of global carbon emissions, deforestation significantly impacts total emissions in some regions. About 90% of global carbon emissions come from fossil fuel combustion processes, leaving the remaining 11% to emissions from land-use change (**Figure 1**). However, the relative weight of carbon emissions from combustion and land-use change[1] is very different in economies with a natural resources endowment with forests' dominance. Land-use change in forest areas due to net deforestation is responsible, for instance, for 60% of Brazil's carbon emissions or Colombia's 40% (**Figure 1**).[2]

Figure 1. **CARBON EMISSIONS FROM FUELS AND LAND USE CHANGE (FOREST AND REST).** SHARE, %. 2013-2022



Source: BBVA Research from The Global Carbon Budget 2023 (Friedlingstein et al., 2023b, ESSD)

The highest land-use emissions occur in tropical regions, notably Brazil, Indonesia, and the Democratic Republic of the Congo, due to large-scale deforestation for agricultural expansion. In contrast, regions like Europe experience carbon uptake due to forest regrowth (including re-/afforestation).[3]

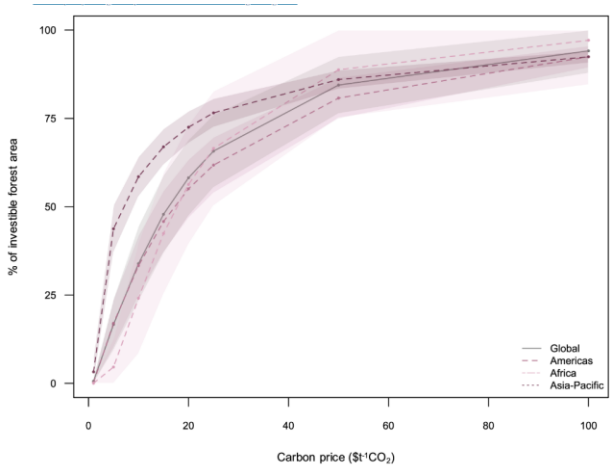
Forests capture carbon, regulate water cycles, preserve soil, support biodiversity, and provide recreation. Forests provide vital ecosystem services, with carbon capture being one of the most crucial. Through the process

1: Emissions derived from land use are set aside, as they have a significant non-anthropogenic component linked to the natural carbon cycle process.
2: Net CO_2 emissions from land-use change (ELUC) encompass several components: emissions from deforestation, forest (re)growth, wood harvest and other forest management, peat drainage and peat fires, and other land-use transitions.
3: Global Carbon Budget 2023.

of photosynthesis, trees absorb carbon dioxide from the atmosphere, storing it in their biomass and soil. This helps mitigate climate change by reducing greenhouse gas levels. Forests act as carbon sinks, with mature forests capturing and storing significant amounts of carbon over long periods. In addition to carbon sequestration, forests offer numerous other ecosystem services, such as regulating water cycles, preserving soil quality, supporting biodiversity, and offering recreational spaces. All in all, protecting and restoring forests is essential for maintaining their multifunctional role in sustaining environmental health and human well-being.

Internalize the positive externality of forest's services. However, ecosystem services that do not generate monetary flows, particularly carbon capture and storage, are not accounted for. The establishment of carbon markets would allow this positive externality to be internalized to mitigate climate change, contributing to their conservation by generating monetary flows that can facilitate social development and, at the very least, make transparent the cost of activities that depreciate natural capital and hinder sustainable growth.

Figure 2. **EFFECT OF CARBON PRICING ON THE FINANCIAL VIABILITY OF FOREST CARBON SITES**



Source: Carbon prospecting in tropical forests for climate change mitigation | Nature Communications, from Forest-based-carbon-markets-pitfalls-and-opportunities. The graph indicates the proportion of financially viable forest carbon. The shaded areas around the lines represent confidence bands based on the standard deviation.

Carbon price: opportunity cost of deforestation, price of reforestation, with uncertain empirical estimation at aggregated level. The price assigned to each ton of carbon captured must at least cover the cost of alternative land uses occupied by the forest or intended for reforestation (the opportunity cost compared to agriculture, livestock, mining, illicit activities), as well as its maintenance and future conservation. Higher prices for carbon capture increase the percentage of forested areas potentially profitable as carbon sinks. At global level, carbon pricing at \$16 $t^{-1}CO_2$ and \$44 $t^{-1}CO_2$ are needed to protect 50 and 80% of investible carbon sites, respectively (**Figure 2**). Carbon price increases above \$50 $t^{-1}CO_2$ would only bring marginal forest conservation and climate mitigation benefits.[4] However, estimating the carbon price required to achieve the profitability threshold is very uncertain. This uncertainty arises from various factors, including the amount of carbon captured by different types of forests, soil, and climate regime, the evolution of the profitability of alternative crops, or long-term maintenance costs.[5] This is especially true in economies where the quantity and quality of available statistical information have room for improvement.[6]

4: Koh, L.P., Zeng, Y., Sarira, T.V. et al. Carbon prospecting in tropical forests for climate change mitigation. Nat Commun 12, 1271 (2021). https://doi.org/10.1038/s41467-021-21560-2.
5: Ibid 4.
6: For further analysis about carbon pricing and the opportunity of forests for carbon capture: Sergio L. Franklin Jr., Robert S. Pindyck. A Supply Curve for Forest-Based CO2 Removal. March 2024. NBER Working Paper 32207.

Box 1. Forest Development and the Structure of Carbon Markets[7]

The carbon markets ecosystem is intricate due to the variety of market types and mechanisms they use. The table below outlines the various types of markets, the mechanisms they employ, and the kinds of products they issue.

Type of Market	Mechanism	Issued Product
Compliance Carbon Markets (CCMs)	Cap-and-trade mechanism	Carbon emission allowances
	Baseline-and-credit mechanism	Carbon emission allowances
Voluntary Carbon Markets (VCMs)	Project-based mechanism	Reduction or Avoidance carbon credits Removal/Sequestration carbon credits.
Article 6.4 of the Paris Agreement	Project-based mechanism	Art.6.4 Emission Reductions (Art.6.4 ERs)
Clean Development Mechanism (CDM)[10]	Project-based mechanism	Certified Emission Reductions (CERs) Credits

Source: IOSCO, December 2023

- **Compliance Carbon Markets (CCMs)**: These markets operate through cap-and-trade and baseline-and-credit systems to issue carbon emission allowances. In the cap-and-trade system, a cap is set on total emissions and companies can trade allowances within this limit. The baseline-and-credit system provides credits for emissions reductions achieved below a specified baseline level.
- **Voluntary Carbon Markets (VCMs)**: These markets rely on project-based mechanisms to issue carbon credits, including those for emission reduction, avoidance, and sequestration. VCMs enable organizations to voluntarily buy carbon credits from projects that aim to reduce or remove emissions, such as reforestation or renewable energy initiatives, to offset their own carbon emissions.
- **Article 6.4 of the Paris Agreement**: This mechanism uses a project-based approach to create Art.6.4 Emission Reductions (ERs). It is designed to encourage international collaboration in cutting greenhouse gas emissions and promotes sustainable development by allowing the trade of certified emission reductions among countries.
- **Clean Development Mechanism (CDM)**: Introduced under the Kyoto Protocol, the CDM also employs a project-based system to generate Certified Emission Reductions (CERs). These credits are awarded for emission reduction projects in developing countries and can be used by industrialized countries to help meet their emission reduction commitments.

For **carbon capture in forests**, VCMs are particularly suitable due to their focus on project-based mechanisms, which can include reforestation and conservation projects. These projects help sequester carbon and generate credits, thus providing a financial incentive for forest conservation and restoration efforts.

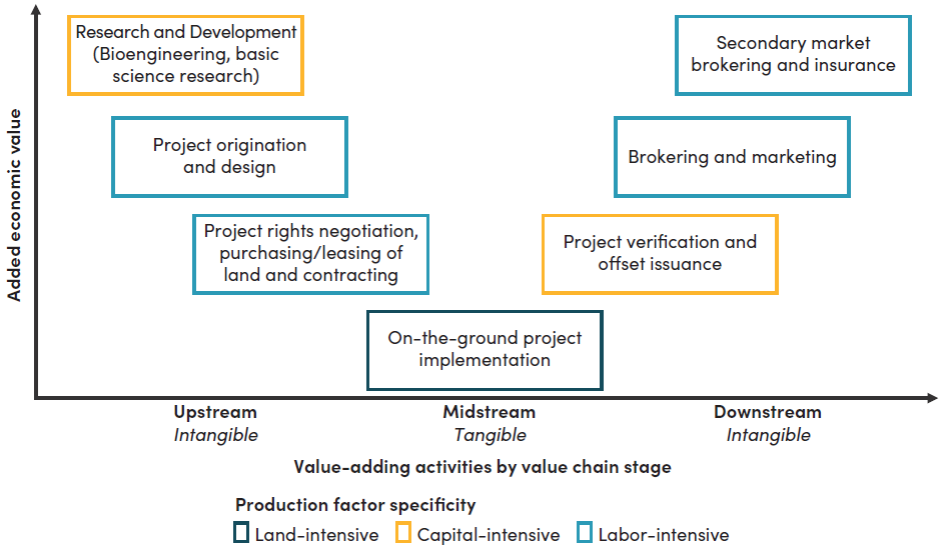
Reaping the benefits of forest carbon markets for climate mitigation and social development. As detailed in **Box 1. The Structure of Carbon Markets,** project-based mechanisms are the most appropriate for the development of forest carbon markets. Within these, voluntary carbon markets are preferable until the international collaboration mechanisms of the Paris Agreement or the Clean Development Mechanism are developed. Against

7: Voluntary Carbon Markets Consultation Report The Board of the IOSCO. December 2023.

this background, developing forest-based carbon markets presents challenges, including high transaction costs and the need for effective governance:[8]

- **Addressing Transaction Costs**: High-quality carbon credits from forest projects involve significant costs for origination, design, negotiation, approval, implementation, insurance, verification, and enforcement. Streamlining these processes and achieving economies of scale are essential to make projects financially viable.
- **Value Chain Considerations**: The carbon credit value chain includes upstream (land acquisition, project management), midstream (approval, measurement, verification), and downstream (insurance, brokerage) activities (**Figure 3**). Developing countries must capture a larger share of the revenue from these activities to benefit fully from forest-based carbon markets.

Figure 3. **LOCATION OF VALUE ADDITION AND PRODUCTION FACTOR SPECIFICITY IN THE FOREST CARBON VALUE CHAIN**



Source: Forest-Based Carbon Markets: Pitfalls and Opportunities | Center For Global Development.

- **Establishing National Carbon Federations**:[9] To overcome market failures and ensure equitable distribution of benefits, the creation of National Carbon Federations is proposed. These federations would help small-scale carbon producers access markets, improve bargaining power, and manage risks effectively. They can also ensure that revenues from carbon markets are reinvested in public goods and services.
- **Ensuring Biodiversity and Ecosystem Protection**: Forest-based carbon markets must balance carbon sequestration goals with biodiversity conservation. This requires integrating biodiversity targets into carbon market policies to avoid negative impacts on ecosystems and local communities.

Overall, forest-based carbon markets offer significant opportunities for developing countries but require robust institutional frameworks, effective governance, and comprehensive policies to maximize benefits and mitigate risks.

8: For further details: M. Cárdenas, JJ Guzmán Ayala. Forest-Based Carbon Markets. Pitfalls and Opportunities. CGD Policy Paper 313. November 2023.
9: Ibid 8.

Highlights of the Week

- **Global |** Developed countries materially surpassed their USD 100 billion climate finance commitment in 2022 - OECD. Developed countries provided and mobilized USD 115.9 billion in climate finance for developing countries in 2022, exceeding the annual 100 billion goal for the first time and reaching a level that had not been expected before 2025.
- **Global** | No need for countries to issue new oil, gas or coal licenses, study finds | Fossil fuels | The Guardian. Researchers say world has enough fossil fuel projects planned to meet demand forecasts to 2050 if net zero is reached.
- **USA** | Carbon Offsets, a Much-Criticized Climate Tool, Get Federal Guidelines - The New York Times. The new principles aim to define 'high-integrity' offsets amid concerns that current practices often don't cut greenhouse gas emissions as claimed.
- **Europe** | Europe Can Reap Sizable Energy Security Rewards by Scaling Up Climate Action. Meeting the continent's emission reduction targets could enhance energy security metrics by 8 percent by 2030—and that would be just the start.
- **Spain** | Crisis climática en España: las olas de calor se vuelven más intensas y los récords de calor diario se disparan. Aemet rastrea los impactos del calentamiento global en 2023, el segundo año más cálido registrado hasta ahora en el país.

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