

Pathways to value

Achieving a breakthrough for international climate finance for tropical forest conservation



FOREST
TRENDS

Rupert Edwards

September
2024

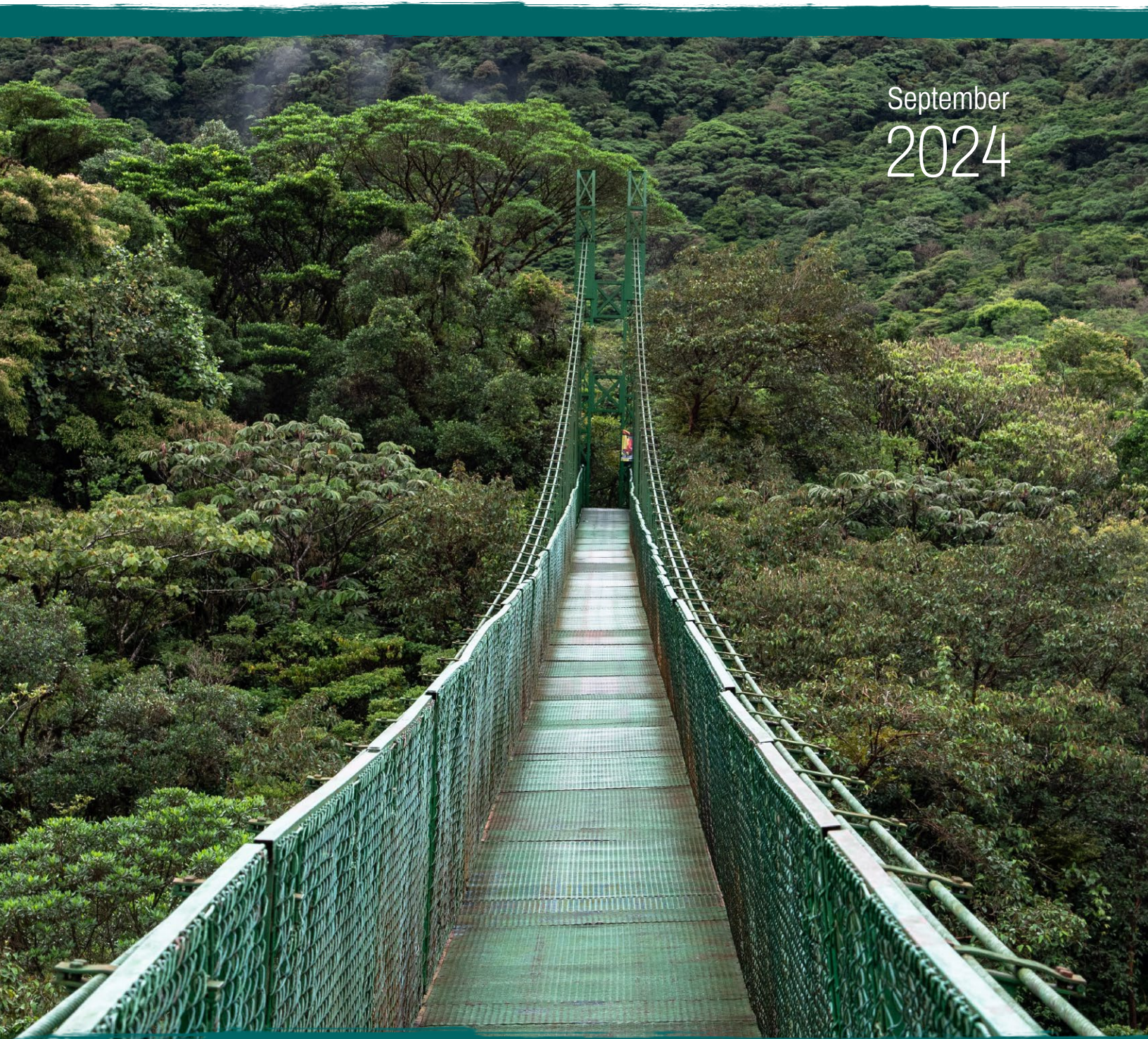


Table of Contents

Abstract	1
Introduction	1
The past: International climate finance for REDD+ has made progress but failed to achieve scale	2
The present: Carbon pricing as a pathway to value for REDD+	4
The future: Linking pathways to value. How to achieve a breakthrough for REDD+ and get to scale	8
Prices for REDD+ credits should be higher	9
It remains challenging for forest countries to access upfront finance	9
Scaled-up demand and the provision of price floors from international donor governments can build market confidence	10
A supply-side signal at scale can unlock frustrated demand potential	10
Identifying forest country investment needs	11
Pathways to value: Linking to Multilateral Development Bank concessional financing	11
Pathways to value: Linking to efforts by importing countries and companies to eliminate deforestation from their commodity supply chains	12
Conclusion	12
References	13

Abstract

Reversing the global trend of tropical forest loss remains the largest barrier for natural climate solutions contributing to climate goals at their fullest potential. This paper looks at past challenges to scaling finance to end tropical deforestation and restore degraded forests. We then consider a set of core “pathways to value” for REDD+. Within these pathways, we conclude that support for forest countries in the form of results-based finance from international governments remains an essential tool. And that public results-based payments combined with private sector demand for high integrity carbon credits (based on jurisdictional baselines) has the highest potential for mobilizing finance at scale. We examine how to achieve a breakthrough for REDD+ through a set of strategies to increase credit prices; improve access to upfront finance; utilize donor government support to set price floors and create demand signals; and use “Offers for Sale” from forest countries to support price discovery and leverage concessional finance from multilateral development banks. Offers for Scale are contractually binding commitments for large-scale sales of high-integrity jurisdictional and nested credits with minimum volume and value targets.

Introduction

Markets and payments for a range ecosystem services and values have proliferated in the past three decades, in part thanks to the efforts of The Katoomba Group, a practitioner network launched by the non-profit Forest Trends. Since 2000, Katoomba Meetings have occurred all over the world. The Katoomba Group has been catalytic in the development of the World Bank’s BioCarbon Fund, Mexico’s national payments for ecosystem services fund, and Peru’s natural infrastructure water tariff — all flagship models in creative finance for nature conservation. This year’s Katoomba meeting in October 2024 in the group’s birthplace outside Sydney, Australia, both looks back over the last 25 years and forward to the next 25 years (and thus the 2050 Net-zero goal). A key theme will be scaling pathways to value for markets for ecosystem services, as well as public and private investment instruments, to deliver on global climate and biodiversity goals.

The biggest natural climate challenge for the Paris Agreement relates to reversing the trend of tropical deforestation. Given the central importance of tropical forest conservation and the fact that much of the architecture for financial support is in place, this briefing paper focuses on “pathways to value” for REDD+.¹ REDD+ was structured by the United Nations Framework Convention on Climate Change (UNFCCC) with a focus on climate outcomes. However, the success of REDD+ is also critical for biodiversity, the United Nations Convention on Biological Diversity, and the 2024 Global Nature Positive Summit in Sydney.

- We start by looking at the past: initiatives aimed at Reducing Emissions from Deforestation and forest Degradation (REDD+) and how they have made progress with different forms of international climate finance as “pathways to value” but failed to achieve scale (including public results-based finance; private purchases of carbon credits; grants, concessional, and blended finance; and sustainable timber and agricultural supply chains).
- We then discuss the present: the role of carbon pricing and carbon credits as a key pathway to value in supporting public finance for REDD+.
- We then look forward to the future: how the field might achieve a breakthrough for REDD+ at scale by linking different forms of climate finance.

¹ Reducing Emissions from Deforestation and forest Degradation (REDD) in developing countries, plus sustainable management of forests and the conservation and enhancement of forest carbon stocks (the + in REDD+).

The past: International climate finance for REDD+ has made progress but failed to achieve scale

Today we are still far from being on track to meet the Paris Agreement target for ending tropical forest loss by 2030. As we look back over the last two decades, we see persistent annual loss of millions of hectares of primary tropical forest.² The United Nations New York Declaration on Forests in 2014 failed to come close to meeting its 2020 goals (on deforestation, reforestation, and deforestation-free supply chains). A major reason for slow progress has been the persistent finance gap for tropical forests. A recent report by The Energy Transitions Commission concluded that the cost of protecting all forests at high risk of deforestation by 2030 would exceed US\$130 billion per annum (2023), while currently grant and concessional finance amount to only around US\$2-3 billion per annum. In this context, it is right to step back and consider the “pathways to value,” including the role of payments for ecosystem services (PES) in the form of carbon credits, and consider how to scale up international climate finance.³

For REDD+, potential pathways to value include:

1. Private carbon credit purchases (predominantly for offsetting purposes)
2. Efforts by importing countries and companies to eliminate deforestation from their commodity supply chains, particularly for high-risk commodities including timber, cattle, soy, palm, and cocoa
3. International public climate finance (such as grants and concessional lending from multilateral development banks (MDBs))
4. Public results-based finance (RBF) for REDD+ from donor governments and multilateral agencies

In this section, we consider progress to date for each of these pathways in turn.

Private carbon credit purchases

Crediting mechanisms for offsetting have matured into useful instruments in many domestic compliance markets (e.g., US wetland mitigation banking was worth an estimated \$11.7 billion in 2023 (United Nations Environment Programme 2023). However, except for the International Civil Aviation Organization’s recent development of its Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA), international compliance market demand has been absent for REDD+ credits. It is, of course, more complicated to set up compliance markets internationally than domestically. Meanwhile, the Voluntary Carbon Market (VCM) has been the recipient of partially justified criticism on integrity grounds, which has severely hampered demand potential and thus financing flows. Concerns around integrity are generally more likely in voluntary than compliance markets on both the demand and supply sides.

² Tropical primary forest loss in 2023 totalled 3.7 million hectares. While this represents a 9% decrease from 2022 (thanks largely to political shifts in Brazil and Colombia), the rate in 2023 was nearly identical to that of 2019 and 2021. <https://research.wri.org/gfr/latest-analysis-deforestation-trends>.

³ Public PES have historically been diverse: For example, at the international level we have seen government or multi-lateral-to-government results-based finance for REDD+ under Article 5 of the Paris Agreement. Or at the local level, Costa Rica’s pioneering PES Program (a public financial mechanism for owners of forests for the environmental services they provide) and in Europe more recently a range of agriculture subsidy programs shifting toward “public money for public goods.” Private PES has included payments for credits (usually for offsetting purposes) driven by regulated compliance demand (e.g., Kyoto Clean Development Mechanism, ICAO’s CORSIA, California Air Resources Board offset program, the US EPA’s mitigation banks for wetlands, UK Biodiversity Net Gain and nitrate offset regulations); or by voluntary demand (as in the Voluntary Carbon Market/VCM).

Therefore, international private purchases of credits have not delivered finance at scale for tropical forest conservation or regeneration. Issuance of all types of project-based credits amounted to only 353 million tons in 2023, with credits for nature-based avoided and reduced emissions only 55 million tons (Mikolajczyk and Díaz 2024). In 2023, the total reported transaction value of the VCM was only US\$723 million, according to Ecosystem Marketplace's State of the Voluntary Carbon Market 2024 report.⁴

Sustainable timber and agriculture commodity supply chains

In the last decade and a half, countries and companies have attempted to remove illegal and unsustainable deforestation from commodity supply chains (e.g., The Lacey Act in the United States (US) and the European Union (EU) Timber Regulation of 2013, as well as the Soy Moratorium (Heilmayr et al. 2020)). The EU is the second largest importer of agricultural commodities linked to tropical deforestation and the new EU Deforestation Regulation (EUDR) is hoped to bring down greenhouse gas emissions and biodiversity loss (in the same way that, for example, the EU regulation on car vehicle standards has been influential in driving global technology change.)⁵ However, seven EU member states have called for delay in the implementation of the regulation, as it is putting burdens on developing countries that do not have the capacity to meet the EUDR (Beattie 2024).

Overall, demand-side measures from commodity importing countries have failed, to date, to provide forest countries with the fiscal resources needed to shift to more sustainable land-use practices. This is the key reason for the failure of the New York Declaration on Forests of 2014.

Grants, concessional, and blended finance

As noted above, grant and concessional finance for tropical forests currently amounts to only around US\$2-3 billion per annum (Energy Transition Commission 2023). Bilateral and multilateral grant and lending programs are welcome but insufficient. For example, in May 2023, the United Kingdom (UK) committed £80 million/US\$101million to Brazil's Amazon Fund, a contribution that built on the launch of the Forest and Climate Leaders' Partnership at COP27 (The Prime Minister's Office, 10 Downing Street).

The Network for Greening the Financial System has described how expectations that blended finance will play a pivotal role in attracting private capital to emerging markets and developing countries (EMDEs) are falling short of delivering what is needed to address climate challenges. Most of the transactions to date have been in middle-income countries, while low-income countries have attracted a low share. Current blended finance practices have come under increasing criticism for low mobilization and leverage ratios. Meanwhile, many solutions are not scalable and cannot be easily integrated into well-established business models, and blended finance is often time- and effort-intensive, requiring more complex treatment by investors within their investment processes, as well as by regulators. To improve the investability of EMDEs, there are several key necessary prerequisites. The right climate policies (such as carbon pricing) should be in place and the climate information architecture should be strengthened.

Development finance in the forms of grants and loans must play an important role in REDD+, not least in helping to overcome upfront finance challenges. However, neither grants nor the concessional element in multilateral development bank (MDB) loans will approach the multiple tens of US\$ billions

⁴ Ecosystem Marketplace is an initiative of Forest Trends, located at 1203 19th Street NW, 4th Floor, Washington, DC 20036 | info@ecosystemmarketplace.com | www.ecosystemmarketplace.com | www.forest-trends.org

⁵ For a discussion of the effect of EU regulation on the global car market, see: Sharpe, Simon. 2023. *Five Times Faster. Rethinking the Science, Economics, and Diplomacy of Climate Change*. World Resources Institute. <https://www.cambridge.org/gb/universitypress/subjects/earth-and-environmental-science/environmental-policy-economics-and-law/five-times-faster-rethinking-science-economics-and-diplomacy-climate-change>.

that could in theory be available for public and private results-based finance (RBF) for jurisdictional REDD+ credits. Donors will commit more resources to verifiable results when the risk of achieving those results is transferred predominantly to the countries responsible. Forest country governments themselves are best placed to manage the risks of ensuring success. Another advantage of RBF is that forest countries are better able to choose their own pathways to achieving goals, avoiding the conditionality often associated with input-based aid programs (Birdsall, Kuczynski, and de Nevers 2015; Seymour and Busch 2016)

Public results-based finance

Considerable efforts have been made, including grants and capacity building, to develop an architecture for REDD+ accounting to support results-based finance under Article 5 of the Paris Agreement (including by UN agencies, the World Bank, Norway, Germany, the UK, the US). However, to date, public RBF has not followed up by supporting tropical forest conservation at anything like sufficient scale. Entities like the Green Climate Fund, the Forest Carbon Partnership Fund, and the governments of Norway, Germany, Switzerland, the United Kingdom, and the United States have significant commitments to REDD+ results-based payments. However, disbursement has frequently been slow or even formally suspended for reasons related to readiness, rising deforestation rates in some host countries, and other delays (Forest Trends' Ecosystem Marketplace). For example, the UN Green Climate Fund's initial allocation of US\$500 million for a pilot REDD+ results-based payments program represented a very small sum of the value necessary to achieve at least a gigaton of emission reductions per annum to end deforestation.

The present: Carbon pricing as a pathway to value for REDD+

As we consider these various pathways in the present day, a few clear signs emerge.

First, forest country policies and programs have so far played a much more important role than carbon credits in reducing deforestation (as demonstrated by Brazil's Forest Code and related restrictions on agricultural subsidies to landowners not in compliance, for example).

There has also been widespread agreement over the last two decades that carbon pricing (carbon taxes, cap and trade, credit mechanisms) is central to climate change mitigation economics and policy.⁶ However, there has been some recent criticism of the traditional equilibrium economics approach to achieving Net Zero, with carbon pricing as a "least cost" instrument. Core to this latter argument is that the search for least costs or use of a single social cost of carbon across different economic sectors in traditional equilibrium economic models delays needed expenditure in hard-to-abate sectors (Sharpe 2023). And carbon offsetting is in the crosshairs for this critique since it has been seen as allowing carbon intensive sectors to avoid or delay the needed investment within companies' own operations and supply chains that would be dynamically efficient in bringing down costs.

However, carbon pricing, cap and trade, and carbon taxes have been successful in much of the world, if combined with support for renewable energy, energy efficiency, research and development, and other regulations and policies. US and European land-use sectors are seeing adoption of carbon and biodiversity market tools (e.g., US wetland mitigation banking⁷ and UK Woodland Carbon Code and Biodiversity Net Gain, while Brazil's Bolsa Verde⁸ is an example of a forest country program aimed at the conservation of ecosystems).

⁶ See for example: World Bank. 2024. *State and Trends of Carbon Pricing 2024*. World Bank. DOI: 10.1596/978-1-4648-2127-1. License: Creative Commons Attribution CC BY 3.0 IGO or *Stern Review: The Economics of Climate Change*. 2006. http://mudancasclimaticas.cptec.inpe.br/~rmclima/pdfs/destaques/sternreview_report_complete.pdf.

⁷ For more information, see: <https://www.epa.gov/cwa-404/mitigation-banks-under-cwa-section-404>.

⁸ For more information, see: <https://www.gov.br/mma/pt-br/composicao/snpct/dpct/bolsa-verde>.

In the meantime, tropical deforestation continues apace. Challenges for forest conservation are not generally technological (in contrast to, for example, the question of how to produce hydrogen powered steel). Rather, the challenge is 1) how to financially support conservation and the development of bioeconomies⁹ over alternative land-use strategies which might have greater short-term economic benefits, and 2) how internationally to provide forest country governments and communities with urgent and much larger-scale financial support to transform their economies to support a sustainable development path.

How can forest countries have confidence that they can secure sufficient finance and support to achieve ambitious national level outcomes? In looking to answer this question, Brazil made a useful proposal at COP28 in 2023 for a Tropical Forests Forever Facility (TFFF) with initial funding of US\$250 billion, which would support countries with a simplified model of results-based payments per hectare of standing forest (Reuters 2023).¹⁰ However, the current TFFF proposal for raising funds into the Facility appears unrealistic, requiring developed country sovereign debt or guarantees to be leveraged into risk assets with potential (though not guaranteed) high returns set aside for forest countries, an approach that governments and multilaterals have not historically been willing to adopt in relation to other pressing international challenges or Sustainable Development Goals (SDGs).

Therefore, international public REDD+ results-based finance for REDD+ credits (under Article 5 of the Paris Agreement) remains an essential tool of international support for forest countries.

The question then is whether, given public fiscal constraints, purchases of carbon credits by private actors can boost public aid for forest countries to the level of hundreds of billions over the coming five to ten years. It is true that private finance does not have to come in the form of payments for carbon credits. On the other hand, demand for carbon credits has the potential to drive much more international financial support for non-commercial conservation activities than is likely to come from equity and debt investment.

Carbon credits as a pathway to value for REDD+

The World Bank has characterized carbon credits' demand into four main segments (World Bank 2024):

1. International compliance: Countries voluntarily purchasing credits or "mitigation outcomes" recognized under international treaties, or airlines purchasing credits eligible for meeting their obligations under CORSIA.
2. Domestic compliance: This includes companies purchasing credits that are eligible for meeting their obligations under domestic law, usually an ETS or a carbon tax.
3. Voluntary: This buyer group primarily sources credits issued under independent crediting standards, though some entities also purchase those issued under international or governmental crediting mechanisms.
4. Results-based finance: Purchases of carbon credits by governments or international organizations to help host countries meet targets, without any transfer of credits.

⁹ For a discussion of the bioeconomy see, for example, in Brazil: <https://www.embrapa.br/en/busca-de-noticias/-/noticia/77870291/bioeconomy-in-brazil-can-generate-us-284-billion-in-revenue-per-annum>.

¹⁰ "The TFFF aims to assemble a large pool of capital at a low funding cost to be invested in a diversified investment portfolio. The TFFF's capital pool would be borrowed from a range of public and private sponsors providing funding at a cost consistent with that of the borrowings of advanced-economy sovereigns. The TFFF will invest in a diversified portfolio generating a financial return above the cost of the capital provided by sponsors, yielding a substantial net return that can be allocated to tropical forest nations that succeed in conserving and restoring their forests." <https://globalfoundation.org.au/wp-content/uploads/2024/06/Brazil-Government-Tropical-Forests-Forever-Initiative.pdf>.

To date, REDD+ has relied primarily on results-based finance, with some international compliance recently via CORSIA, some voluntary demand for project-based REDD+, and more recently through the LEAF Coalition for jurisdictional REDD+ credits alongside public results-based finance.

However, the private sector has struggled to access jurisdictional REDD+ credits. And, although many projects have delivered emission reductions with strong environmental and social benefits, overall demand for project-based credits has been constrained by lack of confidence in the robustness of standards and accounting in the voluntary market and concerns over additionality, permanence, and leakage (Voluntary Carbon Markets Initiative 2023).

As a result, some commentators see any reliance on offsets as doomed to failure on integrity grounds.¹¹

However, many economists argue that appropriate use of offsetting can reduce costs and thus increase climate ambition. One recent study suggested global use of carbon markets could nearly double climate ambition relative to current Paris Agreement Nationally Determined Contributions at the same total cost, with reducing deforestation as a key driver (Piris-Cabezas, Lubowski, and Leslie 2023).

Use of offsetting of some kind is seen as fundamental to achieving the “net” in net zero (Rogelj et al. 2018). The UN Intergovernmental Panel on Climate Change (IPCC) Special Report 1.5°C provides insights into extremely high carbon costs for hard-to-abate sectors. The IPCC has said that the need for carbon dioxide removals (both natural solutions and technological) is “unavoidable” if the world is to meet the Paris Agreement’s climate goals. The amount of carbon removal required ranges from 5-16 gigatons of carbon dioxide equivalent (GtCO₂e) per year by mid-century. Restoring natural carbon sinks, like forests, is cost-effective but, given some risks of the impermanence of natural sinks, the world will also need engineered carbon removal technologies (Schumer et al. 2022). As a result, for example, the EU is examining rules for engineered removals to ensure domestic hard-to-abate sectors can achieve net zero. For the same reason, major technology companies are investing in engineered removals (Young 2024).

The net-zero agenda, therefore, means that private sector demand potential for REDD+ credits could be very high, even while maintaining ambitious net-zero pathways in corporate operations and value chains. However, this demand potential is currently under-exploited.

Ending tropical deforestation is a sine qua non for achieving Paris Agreement goals. As much as 30 times more land is needed for reforestation to generate the same climate mitigation outcome as avoided deforestation in the first place, and tropical forests have co-benefits which engineered removals cannot provide (Griscom et al. 2017). So, the case for securing private payments for “high integrity”¹² REDD+ credits to support public climate aid and forest country domestic resources is overwhelming. Can integrity be achieved on both the supply and demand side?

Supply-side integrity in the Voluntary Carbon Market and under Article 6 of the Paris Agreement

In the context of REDD+, credibility has already been achieved on the supply side by jurisdictional REDD+ accounting standards such as ART TREES. Jurisdictional REDD+ reduces risks related to double counting, additionality, leakage, and permanence, and is integrated with the UNFCCC and Paris Agreement frameworks. The role of the UNFCCC as ultimate judge and jury is critical in accounting for

¹¹ See, for example: Romm, Joseph. 2023. *Are carbon offsets unscalable, unjust, and unfixable—and a threat to the Paris Climate Agreement? A University of Pennsylvania Center for Science, Sustainability, and the Media White Paper.* <https://web.sas.upenn.edu/pccsm>.

¹² By “high integrity,” we refer to emissions reductions generated at the jurisdictional level (including nested projects) with strong compliance to social and environmental safeguards, including gender quality considerations, and measured, reported, and verified following international best practice in carbon accounting.

REDD+ and managing uncertainties in relation to, for example, long-term permanence in the context of Paris Agreement goals (just as governments regulating domestic compliance markets are critical to confidence in domestic accounting frameworks). Moreover, jurisdictional REDD+ can provide the greatest opportunity, in the medium term, for forest countries to secure large-scale public and private finance, since it can support governments driving forest conservation policies and programs at national scales.

At the same time, the VCM is moving to ensure the integrity of carbon accounting for individual REDD+ projects “nested” against jurisdictional baselines. Verra’s new consolidated REDD methodology offers the opportunity for individual projects to use jurisdictional baselines (such as under ART TREES (2021)) (Verra 2023). These developments could increase confidence in integrity and thus overall levels of demand. A recent survey found that most respondents “preferred and were willing to pay for JREDD+ credits, a sign of the potential that programs using jurisdictional-level approaches and impact quantification may have to attract buyers and elevate quality” (Ponce de León Baridó et al. 2023).

Development and implementation of Article 6 of the Paris Agreement continues, although much delayed. Agreement would help the VCM link to the UNFCCC framework. Article 5 continues to provide an avenue for REDD+ results-based finance and Parties could support project-based approaches that use jurisdictional baselines of the kind supported under Article 5.

Compliance demand is also likely to increase. CORSIA’s first phase could drive substantial demand for credits with “corresponding adjustments.”¹³ Phase 1 will impact all international flights between signatory countries with forecasted demand of 100 – 200 million credits from 2024 to 2026. But compliance is still voluntary in this phase. The mandatory Phase 2 begins in January of 2027 (Environmental Defense Fund 2024). (Note the recent issuance of 2021 ART TREES credits to Guyana and the first corresponding adjustment for use by CORSIA). Corresponding adjustments could also be used in the context of nested REDD+. Meeting this demand requires countries to have capacity for Article 6 accounting. It also requires a much greater scale of supply and much higher prices as we discuss below.

Compliance demand is also emerging in other contexts, albeit currently at a small scale. Singapore is allowing 5 percent of its carbon tax to be paid in-kind from international offsets with corresponding adjustments. ART TREES has an MOU with the government to supply jurisdictional REDD+ credits.

If confidence in the integrity of REDD+ credits has been achieved for jurisdictional REDD+ on the supply side, can confidence be achieved on the demand side about the legitimacy of a limited use of carbon credits to compensate for and neutralize emissions?

Demand-side integrity concerns

As Mark Carney has put it: “Demand integrity means companies that invest in carbon credits do not delay the decarbonisation of activities over which they have most control. Only those performing against ambitious targets and transition plans should earn the right to invest in credits.” (2024).

Efforts have focused on the importance of internal operational and value chain emissions and the potential role for carbon credits to address beyond value chain residual emissions. This includes through the Science Based Targets Initiative (SBTi) (Benson et al. 2024) and the Voluntary Carbon Markets Integrity Initiative (VCMI) (World Bank 2024). The UN High-Level Expert Group on the Net-Zero Emissions Commitments of Non-State Entities recommended a similar approach of reducing

¹³ “An accounting measure performed by national governments under Article 6 of the Paris Agreement to prevent double counting of emissions reductions and removals.” World Bank. 2024. *State and Trends of Carbon Pricing 2024*. World Bank. DOI: 10.1596/978-1-4648-2127-1. License: Creative Commons Attribution CC BY 3.0 IGO.

emissions in and beyond the value chain before using carbon credits.¹⁴ While this insistence on using offsets only for residual emissions has dampened potential demand in the VCM in the short term, it has also increased confidence in demand-side integrity over the long-term. And over the medium to long term there remains a very big gap to achieve net zero (Environmental Defense Fund 2024), as evidenced by IPCC carbon removal projections.

Those focused on demand-side integrity, such as the Oxford Principles for Net Zero Aligned Carbon Offsetting, emphasize that credits can play a key role in the short and medium term to protect the carbon stored in vulnerable ecosystems and accelerate the transition to a low-carbon society, but the scope for further emission reductions will decrease as we approach the net-zero target date and organizations must shift over time toward carbon removals as we approach 2050 (Axelsson et al. 2024). SBTi has emphasised the importance of removals over avoidance but has specifically recognized the high integrity of jurisdictional REDD+ credits for beyond value chain emissions (Science Based Targets Initiative 2021).

Emphasis on demand-side integrity has not prevented numerous analyst reports from identifying the potential for demand to grow to the level of multiple gigatons if buyers can be confident of high-integrity premium supply.¹⁵

Analysis of IPCC data updated for emissions in recent years suggests that to have a fifty-fifty chance of achieving only 1.5 degrees Celsius of warming, the world had (as of 2023) only around 250 gigatons (Gt) of remaining carbon budget and would need to hit net zero by 2030 (Lamboll et al. 2023). If anything even close to this scenario is to be achieved, and with current global emissions of 40 gigatons per annum, even limited use of REDD+ credits for compensation and neutralization of unabated emissions would create demand materially greater than one gigaton per annum for high-integrity credits.

If we can have confidence in supply and demand side integrity, we can then consider how to harness private demand for carbon credits to support public results-based and concessional finance to achieve scale.

The future: Linking pathways to value. How to achieve a breakthrough for REDD+ and get to scale

This section examines how to link the four pathways to value: public results-based finance, private carbon credit purchases, and other forms of international climate finance (such as grants and concessional lending from MDBs) to 1) secure sufficient international funding to support forest country shifts to sustainable land-use practices and 2) link up to efforts with importing countries and companies to remove deforestation from their commodity supply chains.

At COP27 in 2022, the UN Environment Programme (UNEP) recommended a commitment to a floor price of US\$30-50 per ton of CO₂e for a substantial volume of REDD+ credits to give forest countries confidence to achieve ambitious NDC targets as a first step to achieve the needed minimum of one gigaton of emissions reductions annually by 2025 (United Nations Environment Programme 2022; Edwards 2021; Edwards 2020).

¹⁴ See: High-Level Expert Group on the Net Zero Emissions Commitments of Non-State Entities. 2022. *Integrity Matters: Net Zero Commitments by Businesses, Financial Institutions, Cities and Regions*. https://www.un.org/sites/un2.un.org/files/high-level_expert_group_n7b.pdf.

¹⁵ See, for example: "Carbon Offset Market Could Reach \$1 Trillion With Right Rules". 2023. Bloomberg NEF, July 2023 <https://about.bnef.com/blog/carbon-offset-market-could-reach-1-trillion-with-right-rules/>.

Despite some progress, such as the formation of the LEAF Coalition,¹⁶ a demand signal sufficient to give forest countries confidence to embark on ambitious national emission reduction programs has yet to materialise at scale, which in turn leaves buyers lacking confidence in the visibility of supply. This “chicken or egg” problem continues to hamper the development of mature market price discovery (Edwards 2020). Donor governments and the private sector have been reluctant to make high forward price commitments in a market that is immature compared to other commodity markets. This has created a lack of visible revenue streams sufficient to drive the requisite upfront investment within forest countries.

As we discussed above, the net-zero agenda means that private sector demand potential for REDD+ credits can be very high. However, it is currently under-exploited. Forest countries need to see demand for high volumes of jurisdictional or nested REDD+ credits at higher prices than today. Consortia of private buyers would welcome the opportunity to secure large-scale high integrity premium supply underwritten by international governments and would be willing to pay materially higher prices and take on greater upfront financial risk.

Forest countries have an opportunity to secure much higher levels of international climate finance to achieve REDD+ goals. A forthcoming paper from UNEP focuses on the opportunities to develop large scale supply-side signals from forest countries for high-integrity carbon credits that can unlock demand potential. Supply-side signals in the form of “Offers for Sale” would be formal proposals and contractually binding commitments for large-scale sales of high-integrity jurisdictional and nested credits with minimum volume and value targets (Edwards 2024).

The architecture of REDD+ has been developed over many years. What is now needed is the opportunity for “price discovery” in relation to high-integrity supply at scale. To date, this has been a challenge due to the very large-scale nature of investment requirements for forest countries at jurisdictional scales (and consequent lack of access for the private sector to jurisdictional REDD+ credits), or due to nested project-based credits which governments and markets would recognize as high integrity.

Prices for REDD+ credits should be higher

On the demand side, REDD+ credit prices ought not to be anchored toward an arbitrary choice of price from the World Bank FCPF and other multilateral initiatives which were designed some years ago to help get the market off the ground. Nor should REDD+ credit prices be anchored on prices in a VCM where corporate demand is constrained by integrity concerns. Rather, REDD+ credit prices would be influenced by high decarbonization costs for companies seeking to compensate or neutralize unabated emissions. Insight into the extremely high costs for carbon intensive industries of achieving net zero can be gained from IPCC carbon values. The IPCC Special Report 1.5°C shows carbon costs reaching US\$245-US\$14,300 in 2050 (Rogelj et al. 2018). Given the astronomical costs of fully decarbonizing the sectors where emissions are hardest to abate while next generation technologies are developed, compensating for unabated emissions at, for example, \$30-50/tCO₂e through REDD+ credits generated at scale would represent a cheap option. Moreover, prices of credits with “corresponding adjustments” will need to be materially higher than for those without to reflect the cost to forest countries of exporting a percentage of their emissions reductions.

It remains challenging for forest countries to access upfront finance

International support at the required level of US\$10s of billions per annum will be predominantly results-based. However, there is a need to bridge the gap between future results-dependent jurisdictional REDD+ revenue streams and current capital expenditure requirements. Despite capacity-building

¹⁶ For more information, see: <https://www.leafcoalition.org/>.

support from a few governments and UN REDD, some countries are finding it difficult to access funds for REDD+ preparation and implementation. For those countries advanced in their REDD+ capacity, an even bigger challenge is securing the scale of upfront finance (advance payments, debt, and equity) sufficient to generate emissions reductions results (“Strategic Dialogue on financing large-scale forests conservation and restoration”).

Predictability of large-scale demand for jurisdictional REDD+ credits at high enough prices would provide forest countries with fiscal space to pursue more ambitious conservation goals. The potential for large-scale REDD+ revenue streams would also spur the development of upfront financing instruments (e.g., Multilateral Development Bank/MDB loans, REDD+ bonds (World Bank 2017), sustainability linked bonds).

However, public and private actors who buy REDD+ credits on a forward pay-on-delivery basis will also need to take a greater share of the upfront financing risk if they are to help forest countries achieve results and deliver the supply they seek. Buyers of REDD+ credits may not be the same institutions which would provide debt or equity finance to forest countries. The provision by credit buyers of advanced payments in Emission Reduction Purchase Agreements (ERPAs) would increase the chances of success for forest countries and thus make the likelihood of delivery higher, especially if governments and the private sector work together. In return for upfront payments, jurisdictions could offer preferential terms.

Scaled-up demand and the provision of price floors from international donor governments can build market confidence

Confidence in the market must be bolstered by scaled-up demand from a broader coalition of donor governments for the highest integrity standards. International governments, as part of the global climate finance infrastructure, will increase the speed and likelihood of success by underwriting demand, increasing overall demand, and providing a “halo” effect, confirming their perception of the integrity of certain crediting standards. Governments underwriting a percentage of Offers for Sale would also be able to insist on participating private sector buyers meeting demand-side integrity standards.

Governments and the UN Green Climate Fund (GCF) should also increase the provision of price floors of the kind that has been pioneered by Norway and do so at higher prices, to send a signal to other buyers on the real price/value of jurisdictional REDD+ credits. The use of price floors for jurisdictional REDD+ by governments has been massively underutilised to date. Floor prices bring the certainty of a results-based payment for forest countries while maintaining the option of achieving a higher payment in the future. The provision of floor prices can also allow for public funding commitments to be recycled if options built into floor prices are not exercised. This would represent a highly effective leverage of public to private capital (United Nations Environment Program 2023; Bodnar et al. 2017; Edwards 2020).

A supply-side signal at scale can unlock frustrated demand potential

Offers-for-Sale (OFS) from forest countries could support price discovery. On the one hand, a key challenge is how further to build the demand signal to unlock supply. On the other, however, a large-scale supply side offer price signal would open demand potential. The Call for Proposals and “demand signal” from LEAF has proven catalytic in attracting responses from jurisdictions; a larger scale “supply signal” would further accelerate the dynamic. LEAF currently only has potential to pay for 150 million tons. Offers for Sale would go above that volume, enabling jurisdictions to be more proactive in supporting price discovery.

Some forest countries at an advanced stage of REDD+ capacity (such as Brazil and Indonesia) have ambitious goals and immediate financing needs. Rather than waiting for the demand signal to grow, individual forest countries could announce Offers for Sale (OFS) at the jurisdictional scale or at the multi-project landscape scale for forward purchase with minimum targets for volume and value. We assume overall integrity for multi-project landscape scales programs would be achieved through use of jurisdictional baselines. The purpose of these minimum targets would be to enable forest countries to have visibility on future revenue streams at a sufficient scale to believe jurisdictional REDD+ investment programs will be successful.

This approach could elicit materially more private sector willingness to make large-scale forward price commitments at higher prices.

Visibility on large-scale supply of high-integrity credits should not reduce prices in compliance or voluntary credit markets (as might occur in an efficient, mature market). Rather it would have a magnetic effect in drawing out additional demand, because it would provide opportunities for corporates, supply chain insetters, and investors to meet residual offsetting needs at a meaningful scale. By making visible the potential for large-scale, high-integrity supply, OFS would also drive more public and private appetite to take on upfront financial risk. Some corporates with expectations anchored by current low prices in the VCM may be initially unwilling to pay higher prices. However, other private actors, spurred on by the high cost to offset residual emissions, will compete to secure access to high-integrity credits at scale.

OFS would, therefore, attract consortia of buyers willing to commit to higher volumes, higher forward prices, and upfront finance for large volumes of REDD+ credits. This could be through the LEAF Coalition or syndicated deals led by MDBs, investment banks, or commodity trading firms.

At a minimum, even if initial supply-side offers at scale indicate prices well above current levels, the international community will see “what it takes” to close the price and finance gap, and the supply and demand sides can explore and discover at what price and value transactions could occur.

Identifying forest country investment needs

Forest countries could identify specific ambitious goals at the jurisdictional or landscape level and calculate overall investment requirements needed to drive action on the ground.

Then countries could calculate the volume of REDD+ results-based and upfront support to “own efforts” that would be required and the price needed for future REDD+ credits sufficient to initiate ambitious programs (recognizing the reality that buyers will make much larger financial commitments for results-based payments).

OFS could secure a high and predictable REDD+ revenue stream (including advance payments) in Emission Reduction Purchase Agreements (ERPAs). OFS could also focus on High Forest Cover Low Deforestation (HFLD) fungible credits under ART TREES.

Countries could aim to retain some percentage of credits for future sales in the “spot” market, once emission reductions have been validated.

Pathways to value: Linking to Multilateral Development Bank concessional financing

Many developing countries have little fiscal space for increasing debt and a powerful case has been made by the High-Level Expert Group on Climate Finance for much larger levels of concessional international climate finance from MDBs (Songwe 2022; Persaud 2023). The predictability of large-scale payments for jurisdictional REDD+ credits (as hard currency revenue streams), secured through

OFS, would increase fiscal space for forest countries, especially if accompanied by higher levels of advance payments. Forest countries could then borrow additional funds in the capital markets, knowing that the investment needed to achieve jurisdictional REDD+ outcomes would in time generate positive financial returns and would not lead to a long-term increase in the national debt. Credit rating agencies could treat short-term increases in the public sector borrowing requirement to achieve and go beyond NDC goals as positive financial investments without negative implications for credit ratings.

At the same time, Development Finance Institutions and MDBs should scale up concessional lending and risk reduction programs to further reduce investment costs. The World Bank should play a critical role in catalyzing upfront investment backed up by large-scale ERPAs. Successful OFS should also spur the development of financing instruments that can bridge the upfront finance gap (e.g., MDB loans, REDD+ bonds, sustainability-linked bonds).

As jurisdictions start to develop a track record in delivering credits, there is also a possibility to secure equity investment that would bring forward the value of future “carbon streams.” A public-private company could attract investors for a share of the future proceeds from OFS for REDD+.

MDBs could also reduce risk on borrowing in US\$ with partial foreign exchange guarantees (Persaud 2023) and reduce the costs of borrowing through a willingness to increase credit ratings through sovereign credit enhancement (Edwards 2018).

Pathways to value: Linking to efforts by importing countries and companies to eliminate deforestation from their commodity supply chains

As jurisdictions develop a track record in delivering REDD+ credits, they would improve the competitive position in international markets of their timber and food producers. Importing countries and companies would prioritize imports from jurisdictions that would allow them to demonstrate compliance with regulations aimed at taking deforestation out of supply chains.

Conclusion

Payments for Ecosystem Services (PES) have developed over the last 25 years into a mainstream tool for governments to implement environmental economics. And within the field of PES, crediting mechanisms for offsetting have matured into useful instruments in many domestic compliance markets. However, in the context of international support for tropical forest conservation and REDD+, the value of carbon credits remains very low relative to the called-for minimum of one gigaton of emission reductions per annum (United Nations Environment Programme 2022). This has been due to the slow development of Article 6 of the Paris Agreement, questions over supply-side integrity in the VCM, lack of compliance markets (until CORSIA), and related questions over demand-side integrity. There is also the challenge related to the very large investment requirements for forest countries at jurisdictional scales, which has restricted supply and resulted in a lack of access for the private sector to jurisdictional REDD+ credits or nested project-based credits which governments and markets would recognize as high integrity.

To date, demand-side measures from agricultural commodity importing countries have failed to provide forest countries with the fiscal resources needed to shift to more sustainable land-use practices.

A recent report concluded that the cost of protecting all forests at high risk of deforestation by 2030 would exceed US\$130 billion per annum, yet grant and concessional finance currently amount to only around US\$2-3 billion per annum (Energy Transitions Commission 2023).

Neither grants nor the concessional element in multilateral development bank loans will approach the multiple tens of US\$ billions that could in theory be available for public and private results-based payments for jurisdictional REDD+ credits. Demand for carbon credits has the potential to drive much more international financial support for non-commercial conservation activities than is likely to come from equity and debt investment.

The case for securing private payments for high-integrity REDD+ credits to support public climate aid, results-based finance, and forest country domestic resources is overwhelming, provided integrity can also be achieved on the demand side, which means “only those performing against ambitious targets and transition plans should earn the right to invest in credits” (Carney 2024).

The net-zero agenda means that the value of private sector demand potential for REDD+ credits can be very high for compensation and neutralization of unabated emissions, even assuming demand-side integrity. Consortia of private buyers would welcome the opportunity to secure large-scale, high-integrity supply underwritten by international governments and would be willing to pay materially higher prices and take on greater upfront finance risk.

There is an opportunity to unlock this potential if forest countries generate clear supply-side signals, through “Offers for Sale” — formal proposals and contractually binding commitments for large-scale sales of high-integrity jurisdictional and nested credits with minimum volume and value targets.

Attempts to discover a “clearing price” are likely to succeed. The architecture of REDD+ has been developed over many years, and many forest countries have developed capacity for REDD+ accounting. What is now needed is the opportunity for “price discovery” related to high-integrity supply at scale.

REDD+ is a critical pathway for achieving Paris Agreement goals. The price and finance gaps must be closed. Donor governments and multilateral coalitions could leverage enormous additional private co-funding for REDD+. They should respond to Offers for Sale at the requisite scale, including with higher pay-on-delivery prices, floor prices, and advance payments.

Multilateral development banks should use the payment commitments from large-scale Emission Reduction Purchase Agreements to secure additional upfront finance for forest countries to achieve ambitious national targets.

References

- ART. 2021. “TREES: The REDD+ Environmental Excellence Standard.” <https://www.artredd.org/trees/>.
- Axelsson, Kayla et al. 2024. *Oxford Principles for Net Zero Aligned Carbon Offsetting* (revised 2024). Smith School of Enterprise and the Environment, University of Oxford. <https://www.smithschool.ox.ac.uk/sites/default/files/2024-02/Oxford-Principles-for-Net-Zero-Aligned-Carbon-Offsetting-revised-2024.pdf>.
- Beattie, Alan. 2024. “Why Brussels can’t see the deforestation for the trees.” *The Financial Times*, July 2024. <https://www.ft.com/content/03ce886b-c110-45fd-bc56-0254daa75969>.
- Benson, Scarlett et al. 2024. *Above and Beyond: An SBTi Report on the Design and Implementation of Beyond Value Chain Mitigation (BVCM)*. SBTi. <https://www.ft.com/content/9db0dafa-73cf-4458-b086-534bad4ed8b1>.
- Birdsall, Nancy, Pedro Pablo Kuczynski, and Michele de Nevers. 2015. *Look to the Forests: How performance payments can slow climate change. A report of the Working Group on Scaling Up Performance-Based Transfers for Reduced Tropical Deforestation*. Center for Global Development. <https://www.cgdev.org/publication/ft/look-forests-how-performance-payments-can-slow-climate-change>.

- Bodnar, P. et al. 2017. "Underwriting 1.5°C: competitive approaches to financing accelerated climate change mitigation, Climate Policy." DOI: 10.1080/14693062.2017.1389687 1.50C. <https://www.tandfonline.com/doi/full/10.1080/14693062.2017.1389687>.
- Carney, Mark, 2024. "Stop debating carbon markets and start building them." *The Financial Times*, June 2024. <https://www.ft.com/content/9db0dafa-73cf-4458-b086-534bad4ed8b1>.
- Energy Transitions Commission. 2023. *Financing the Transition: The Costs of Avoiding Deforestation*. SYSTEMIQ Ltd. <https://www.energy-transitions.org/publications/financing-the-transition-etc-avoiding-deforestation/>.
- Environmental Defense Fund. 2024. *Navigating Jurisdictional REDD+: A Pricing Guide for Tropical Forest Nations*. EDF. <https://library.edf.org/AssetLink/n7sqq42eg5803g67pi3135a6n6004dv6.pdf>.
- Edwards, Rupert. 2024. *Achieving a breakthrough for REDD+: implementing a supply-side offer price signal* (forthcoming 2024). United Nations Environment Programme.
- Edwards, Rupert. 2020. *A Gigaton REDD+ Bid Strategy*. Forest Trends. https://www.forest-trends.org/wp-content/uploads/2020/07/doc_5756_rev_web.pdf.
- Edwards, Rupert. 2021. *The Green Gigaton Challenge: Bringing REDD+ to Scale Primer*. Green Gigaton Challenge. https://www.greengigaton.com/uploads/1/3/4/7/134750777/green_gigaton_challenge_primer_june_2021.pdf.
- Edwards, Rupert. 2018. *Toward an Architecture of Finance to Protect Tropical Forests: The Case of Brazil*. Forest Trends https://www.forest-trends.org/wp-content/uploads/2018/02/doc_5728.pdf.
- Forest Trends' Ecosystem Marketplace. 2021. *A Green Growth Spurt: State of Forest Carbon Finance 2021*. Forest Trends Association. <https://www.ecosystemmarketplace.com/publications/state-of-forest-carbon-finance-2021/>.
- Griscom, Bronson W. et al. 2017. "Natural Climate Solutions." *PNS* 114 (44): 11645-11650. www.pnas.org/cgi/doi/10.1073/pnas.1710465114.
- Heilmayr, Robert et al. 2020. "Brazil's Amazon Soy Moratorium reduced deforestation". *Nat Food* 1, 801–810. <https://doi.org/10.1038/s43016-020-00194-5>.
- Lamboll, Robin et al. 2023. "Assessing the size and uncertainty of remaining carbon budgets." *Nature Climate Change*. 13, 1360–1367 (2023). <https://doi.org/10.1038/s41558-023-01848-5>.
- Mikolajczyk, Szymon, and Jesús Mallol Díaz. 2024. *Voluntary Carbon Market 2023 Review*. Climate Focus. <https://climatefocus.com/publications/vcm-2023-review/>.
- Network for Greening the Financial System. 2023. *Scaling Up Blended Finance for Climate Mitigation and Adaptation in Emerging Market and Developing Economies (EMDEs)*. NGFS. <https://www.ngfs.net/sites/default/files/medias/documents/scaling-up-blended-finance-for-climate-mitigation-and-adaptation-in-emdes.pdf>.
- Persaud, Avinash. 2023. *Unblocking the green transformation in developing countries with a partial foreign exchange guarantee*. Climate Policy Initiative. <https://www.climatepolicyinitiative.org/wp-content/uploads/2023/06/An-FX-Guarantee-Mechanism-for-the-Green-Transformation-in-Developing-Countries.pdf>.
- Piris-Cabezas, Pedro, Ruben N. Lubowski, and Gabriela Leslie. 2023. "Estimating the potential of international carbon markets to increase global climate ambition." *World Development* 167 (2023): 106257. <https://doi.org/10.1016/j.worlddev.2023.106257>.

- Ponce de León Baridó, Paulina et al. 2023. *In the Voluntary Carbon Market, Buyers Will Pay for Quality*. Boston Consulting Group. <https://www.bcg.com/publications/2023/why-vcm-buyers-will-pay-for-quality>.
- The Prime Minister's Office, 10 Downing Street. 2023. "PM meeting with President Lula da Silva of Brazil: 5 May 2023." <https://www.gov.uk/government/news/pm-meeting-with-president-lula-da-silva-of-brazil-5-may-2023>.
- Reuters. 2023. "Brazil proposes global forest conservation fund at COP28." Reuters, December 2023. <https://www.reuters.com/business/environment/brazil-proposes-global-forest-conservation-fund-cop28-2023-12-01/>.
- Rogelj, Joeri et al. 2018. "Mitigation Pathways Compatible with 1.5°C in the Context of Sustainable Development." In: *Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty*, by Masson-Delmotte, V. et al. https://www.ipcc.ch/site/assets/uploads/sites/2/2019/02/SR15_Chapter2_Low_Res.pdf.
- Schumer, Clea et al. 2022. "6 Takeaways from the 2022 IPCC Climate Change Mitigation Report." The World Resources Institute. <https://www.wri.org/insights/ipcc-report-2022-mitigation-climate-change>.
- Science Based Targets Initiative. 2021. *Beyond Value Chain Mitigation FAQ: Version 1*. SBTi. <https://sciencebasedtargets.org/resources/files/Beyond-Value-Chain-Mitigation-FAQ.pdf>.
- Seymour, Frances and Jonah Busch. 2016 *Why Forests, Why Now. The science, Economics and Politics of Tropical Forests and Climate Change*. Center for Global Development. <https://www.cgdev.org/publication/why-forests-why-now-science-economics-and-politics-tropical-forests-and-climate-change>.
- Sharpe, Simon. 2023. *Five Times Faster. Rethinking the Science, Economics, and Diplomacy of Climate Change*. World Resources Institute. <https://www.cambridge.org/gb/universitypress/subjects/earth-and-environmental-science/environmental-policy-economics-and-law/five-times-faster-rethinking-science-economics-and-diplomacy-climate-change>.
- Songwe, Vera, Nicholas Stern, and Amar Bhattacharya. 2022. *Finance for climate action: Scaling up investment for climate and development*. Grantham Research Institute on Climate Change and the Environment, London School of Economics and Political Science. <https://www.lse.ac.uk/granthaminstitute/wp-content/uploads/2022/11/IHLEG-Finance-for-Climate-Action-1.pdf>.
- "Strategic Dialogue on financing large-scale forests conservation and restoration." Session at the United Nations-REDD Programme's Fifth Executive Board Meeting (EB5), September 16, 2021. <https://www.un-redd.org/sites/default/files/2022-03/Agenda%20and%20Background%20UN-REDD%20EB5%20Session%203%20Finance%2016%20September%202021%20%28757031%29.pdf>.
- United Nations Environment Programme. 2022. *Making Good on the Glasgow Climate Pact: a call to action to achieve one gigaton of emissions reductions from forests by 2025*. https://wedocs.unep.org/bitstream/handle/20.500.11822/41131/Glasgow_climate_pact.pdf?sequence=1&isAllowed=y.
- United Nations Environment Programme. 2023. *Pricing Forest Carbon*. https://www.un-redd.org/sites/default/files/2023-02/ForestCarbonPricing_Report_16Feb_FINAL.pdf.
- United Nations Environment Programme. 2023. *State of Finance for Nature: The Big Nature Turnaround – Repurposing \$7 trillion to combat nature loss*. <https://doi.org/10.59117/20.500.11822/44278>.

Verra. 2023. VM0048 Reducing Emissions from Deforestation and Forest Degradation, v1.0. Verra. <https://verra.org/methodologies/vm0048-reducing-emissions-from-deforestation-and-forest-degradation-v1-0/>.

Voluntary Carbon Markets Initiative. 2023. *Claims Code of Practice: Building integrity in voluntary carbon markets*. VCMi. <https://vcmintegrity.org/wp-content/uploads/2023/06/VCMI-Claims-Code-of-Practice.pdf>.

World Bank. 2017. *The Potential Role of Enhanced Bond Structures in Forest Climate Finance*. World Bank <https://openknowledge.worldbank.org/handle/10986/28586>.

World Bank. 2024. *State and Trends of Carbon Pricing 2024*. World Bank. DOI: 10.1596/978-1-4648-2127-1. License: Creative Commons Attribution CC BY 3.0 IGO. <https://openknowledge.worldbank.org/entities/publication/b0d66765-299c-4fb8-921f-61f6bb979087>.

Young, Jeff. 2024. "Why Big Tech Is Pumping Big Money Into Companies Pulling CO₂ From the Air." *Newsweek*, June 2024. <https://www.newsweek.com/why-big-tech-pumping-big-money-companies-pulling-co2-air-1914561>.