PRICING FOREST CARBON

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UN-REDD PROGRAMME

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EXECUTIVE SUMMARY

Pricing forest carbon and putting in place the means and channels to pay for it are necessary conditions to achieve the 2030 mitigation goals. Yet, after more than 15 years of discussion, payments for emissions reductions from forests continue to be unreasonably low, both in terms of price and volume. At the same time, mechanisms already proven in other sectors to increase the catalytic effect of public funds and the participation of the private sector are mostly absent from the toolbox for fighting deforestation and forest degradation. This must change fast. Below is a summary of the main findings from this report: We are in an existential crisis, but forests can deliver for people and planet.

1. ***HIGH-QUALITY AND HIGH INTEGRITY EMISSIONS REDUCTIONS (ERS) FROM REDD+ ARE COST-EFFECTIVE, BUT THEY ARE NOT CHEAP.*** Not all emissions reductions cost the same; some are pricier than others. The average cost of forest carbon ranges from $30-50/tCO2. Furthermore, the high volume of REDD+ supply required to close the emissions gap will be accompanied by increased competition with alternative land uses, resulting in a progressive increase in the cost of forest carbon. Complying with state-of-the-art accounting and crediting standards required to achieve high-integrity ERs will also have significant cost implications. The marginal cost of scalable, high-quality emission reductions (ERs) from REDD+ by 2030 could be as high as the price of carbon on compliance markets.

2. ***SECURING FAIR COMPENSATION FOR FOREST CARBON IS LINKED TO INCREASING THE VOLUME OF TRANSACTIONS OF ERS FROM REDD+ ON COMPLIANCE MARKETS.*** Should REDD+ become part of compliance markets, price and volume would likely increase more than in voluntary carbon markets. In the short term, revenue from voluntary carbon markets can be used to develop market institutions, including monitoring and reporting at the jurisdictional level, and progressively increase compliance with state-of-the-art accounting and crediting standards. This will pave the way for ERs from REDD+ to become fungible assets in the emerging global compliance carbon market, offering more equitable and attractive compensation to tropical forest countries. Eventually, high forest carbon prices on compliance markets will encourage these countries to prioritize and adopt bolder policies for the conservation and restoration of forests at scale, including more ambitious NDC targets.

3. ***THE ADOPTION OF (ALREADY EXISTING) PRICING INSTRUMENTS CAN SIGNIFICANTLY INCREASE THE LEVERAGE EFFECT OF PUBLIC FUNDS TO MOBILIZE PRIVATE FINANCE AND GROW THE SUPPLY OF ERS FROM REDD+.*** Scaling up upfront investment in REDD+ is essential to securing a timely transition to a zero-deforestation pathway and cannot be achieved through public finance alone. Limited public funds can facilitate investments in REDD+ implementation using innovative pricing instruments, such as call and put options, low-risk bonds, and others. These can combine the benefits of flexibility with the predictability of a minimum return on investment, thereby maximizing the leverage effect of public funds on private investors.


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1. FORESTS CAN FILL THE EMISSIONS GAP IN THE TRANSITION TO A CARBON-NEUTRAL ECONOMY

Although tropical rainforests provide a wide range of goods and services on which societies and economies depend at local, regional and global levels, deforestation and forest degradation continue at an alarming rate. It is estimated that 9.3 million hectares of forest – an area equivalent to the size of Iceland or Liberia – were lost every year between 2015 and 2020 (Food and Agriculture Organization of the United Nations [FAO] 2021). Net GHG emissions due to deforestation account for 11 percent of global emissions, more than the entire global transportation sector and second only to the energy sector (Shukla et al. 2019).

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Reducing emissions from deforestation and forest degradation (REDD+) offers the international community an opportunity to mobilize sufficient finance to protect existing forests and facilitate the transition to a carbon-neutral economy. REDD+ provides a cost-effective and scalable solution to close the emissions gap by enabling global mitigation goals to be reached at a lower cost than alternatives in other sectors (Busch et al. 2019; Griscom et al. 2020; Fuss et al. 2021). It has been estimated that every dollar invested in avoided deforestation and forest degradation over the next 70 years would save between $6 to $7 in global mitigation costs to reduce carbon emissions to net-zero (Fuss et al. 2021).

Investing in practices that support inclusive green economy transformations is crucial. To ensure the success of REDD+, a gender perspective should be adopted in order to reduce the risk of perpetuating women's exclusion in policy decision-making processes. Given their involvement in forest management, women should be among the participants and beneficiaries of forest-related sustainable development initiatives. Pro¬cedural gender justice in REDD+ can also help ensure a more equitable distributional outcome for both men and women to improve their economic and social status.

If adequately and inclusively monetized, the carbon benefits of forests could provide a powerful incentive to finally end deforestation and forest degradation. Understanding the cost of reducing forest carbon emissions, as well as the pricing instruments available to incentivize the conservation and restoration of tropical forests, is essential to scaling up the supply of forest carbon emissions reductions and ensuring their permanence.

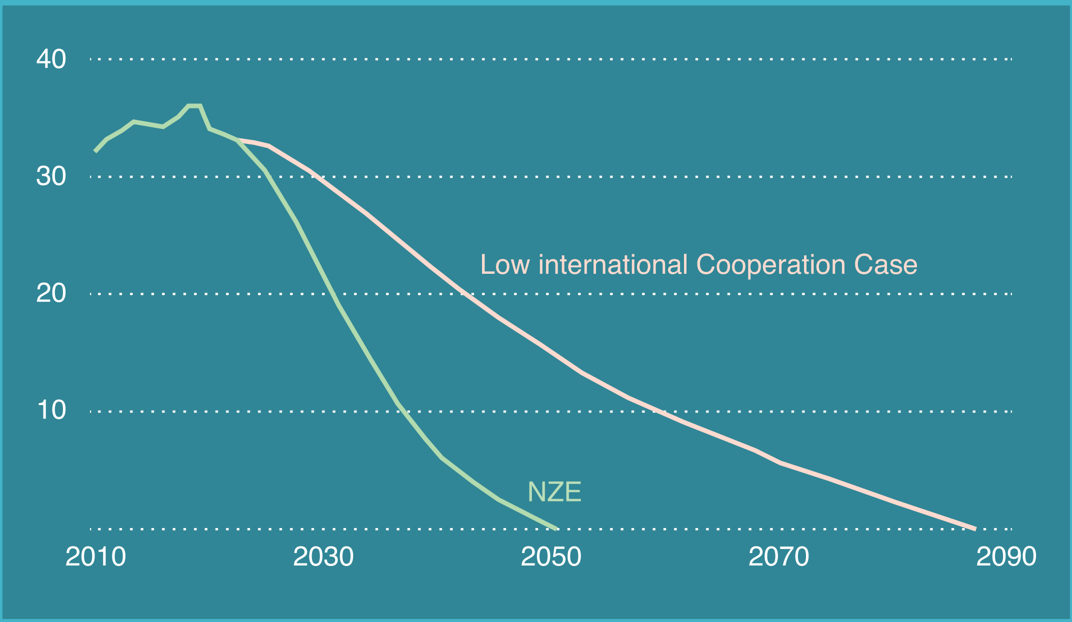
In the next sections, we discuss the cost of REDD+ (Section 1); we examine the state of carbon markets and forest carbon transactions (Section 2), and we present innovative options to bridge the gap between the real cost of REDD+ and current market prices (Section 3). The brief concludes with recommendations.

BOX 1

REDD+ AND THE NET-ZERO EMISSIONS TARGET

The conservation and restoration of tropical forests can fill the emissions gap to transition to a carbon-neutral economy by the middle of this century (Bush et al. 2019; Fuss et al. 2021; Masson-Delmotte et al. 2018).

Figure 1.
Global energy-related CO2 emissions in the Net-Zero Emissions (NZE) pathway and the Low International Cooperation Case pathway



Source: Bouckaert et al. 2021

The NZE curve in the graph above represents the net-zero emissions pathway consistent with limiting the global temperature rise to 1.5 °C. The NZE pathway estimates that the cumulative emissions from the energy sector would amount to 460 GtCO2 and also assumes corresponding GHG emissions reductions in other sectors. Under this pathway, the net GHG emissions from agriculture, forestry and other land use (AFOLU) from now until 2050 would be limited to 40 GtCO2 (Bouckaert et al. 2021).

Unfortunately, the global economy is not on the NZE pathway yet, and the total cumulative emissions are likely to exceed 500 GtCO2. Avoiding deforestation and forest degradation can help close the gap between the current (Low International Cooperation) and NZE pathways by providing up to 100 GtCO2 in net emissions reductions over the next 50 years (Fuss et al. 2021).

2. ESTIMATING THE COST OF REDD+

In the 2000s, forest carbon advocates emphasized the low cost of carbon sequestration by forests and of emissions reductions in the forest sector. Avoided deforestation appeared to be an attractive solution to curbing global carbon emissions. However, critics of forest carbon offsetting expressed concerns that a massive supply of relatively inexpensive emissions reductions would slow the deployment of low-carbon technologies and extend the life of fossil fuels and carbon-intensive capital stock. This concern, which did not materialize, fueled debates about the acceptance of REDD+ and somewhat limited progress in this area.

The available literature presents a wide range of estimates of the costs of REDD+. There are examples of costs below $1/tCO2 or even a negative opportunity cost of avoided deforestation. However, the supply of such inexpensive ERs is limited 1. More recent literature on REDD+ has produced significantly higher costs, with site-specific estimates ranging from $1.9 /tCO2 to $250 /tCO2 (Griscom et al. 2017; Busch et al. 2019; Griscom et al. 2020; Trove Research 2021).

Cost estimates greatly depend on the applied methodology – the choice of cost components, the selected time horizon, the types of alternative land use, etc. All these parameters will have an influence on the result (Fosci 2013; Phan et al. 2014; Rakatama et al. 2017). An accurate and comprehensive estimation of the cost of REDD+ requires taking into consideration several components, including:

- *Opportunity cost, i.e. revenues from an alternative land use that are forgone because of REDD+ implementation.*
- *Transaction cost, including measurement, reporting, and verification (MRV), monitoring, safeguards, etc.*
- *Implementation cost of REDD+ policies and measures, including staff, materials, equipment, maintenance, etc.*

Each of these cost components will contribute to differences in estimates. For example, the opportunity cost of avoided deforestation in Panama (UN-REDD Programme [UNREDD] 2017) could be as high as $50/tCO2 and as low as $0.1/tCO2. Transaction costs alone could range between $1.4 and $7/tCO2 (Nantongo 2019).

Low-cost estimates of ERs from REDD+ can usually be found in bottom-up studies from individual projects and small-scale interventions. Such project-based analyses tend to underestimate the opportunity cost of avoided deforestation, ignoring interactions with the rest of the economy and the broader development context of tropical forest countries. A growing economy and a growing population create additional pressures on land use which often leads to deforestation[2].

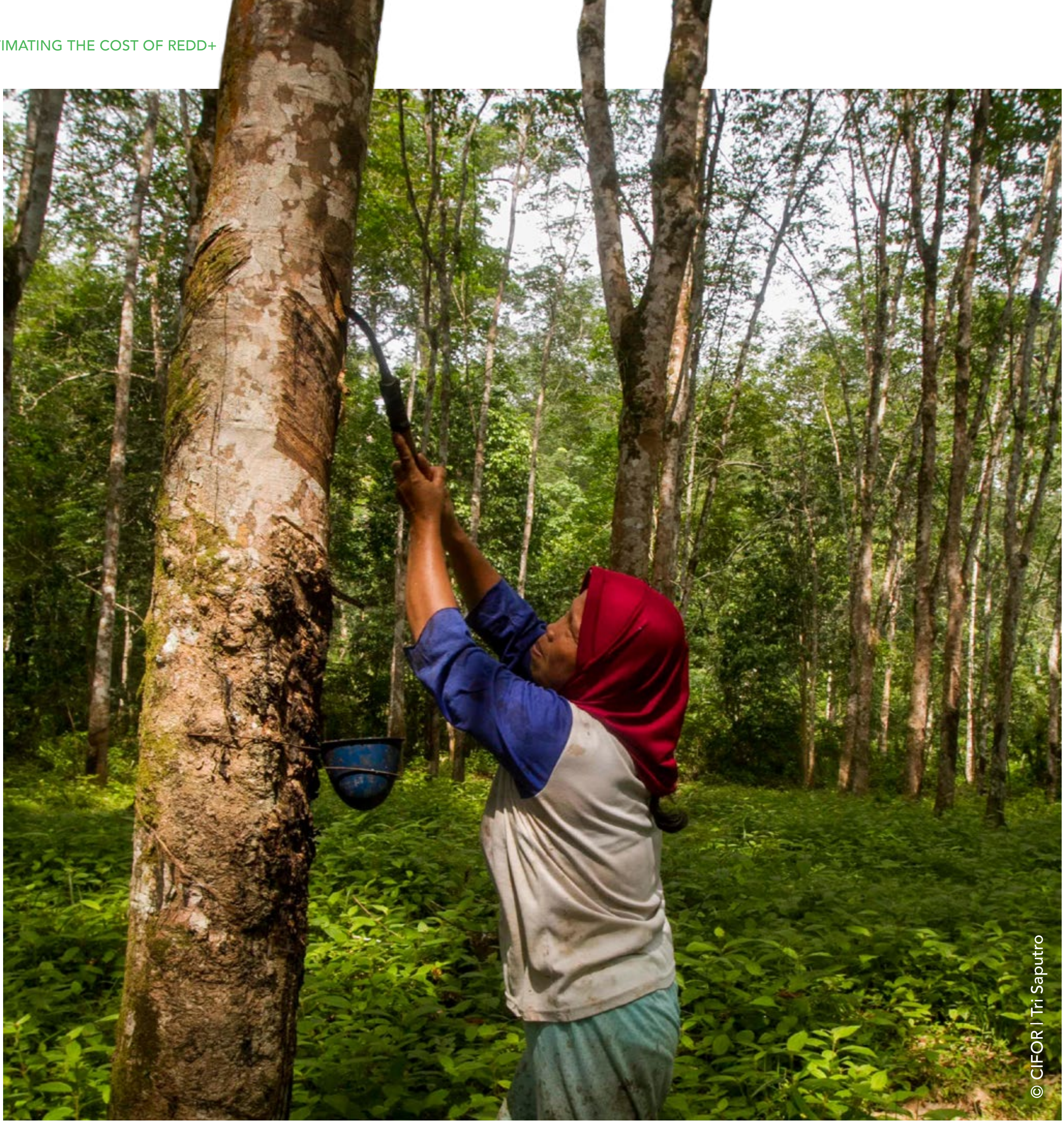
Opportunity cost is a major factor behind differences in the costs of avoided deforestation. Not all emissions reductions cost the same; some are pricier than others primarily due to the potential economic revenues and development gains of alternative land uses. The Panama study mentioned above explains how selecting an alternative land use determines the opportunity cost calculated per hectare of forested land. The site-specific carbon density is another important determinant of opportunity cost per ton of CO2. The opportunity cost of avoided deforestation in a secondary forest is about twice as high as in a primary forest (UNREDD 2017). Furthermore, an increasing supply of REDD+ emissions reductions means a higher average and marginal cost. This is because each country or jurisdiction has a relatively small pool of inexpensive emissions reductions, and further reductions can only be achieved with a higher unit cost per ton of carbon. An expansion of REDD+ also means greater competition with other land use alternatives and higher forgone revenues per ton of carbon.

While estimates of the potential REDD+ supply and cost of avoided deforestation vary across different models and geographies, there are indications that the average cost might be between $30-50 /tCO2 (see, for example, Rakatama et al. 2017 and Busch et al. 2019)3. The literature suggests a massive supply at a price of $100/tCO2. According to Trove

1 Lubowski and Rose (2013) conducted a literature review and found estimates ranging from $0.76 to $10 /tCO2 with an average cost of about $2.5/tCO2. Later publications report a higher cost of avoided deforestation.

2 Performing calculations in a development context, top-down models capture a future increase in the opportunity cost of avoided deforestation.

3 Cost estimated in 2021 USD using an appreciation rate of 4%. The lower bound $30/tCO2 average total REDD+ cost reported by Rakatama et al. 2017 and the upper bound $50/tCO2 correspond to the average cost of REDD+ for cost-efficient supply (see: Bush et al. 2019 and Griscom et al. 2017).



Research, Nature-based Solutions can reduce and remove up to 2,500 MtCO2/year on average between 2020 and 2050. A little over half of this volume (1,400 MtCO2/year) is available at over $50/tCO2 (based on 2020 rates). As a rule, forest restoration is priced higher than avoided deforestation (Griscom et al. 2020; Trove Research 2021).[4]

With an average price currently estimated at $30-50/tCO2, REDD+ provides a cost-effective contribution to close the gap between current emissions trends and the net-zero emissions target (Rakatama et al. 2017; Griscom et al. 2020; Fuss et al. 2021). However, the high volume of REDD+ supply required to close this emissions gap will be accompanied by increased competition with alternative land uses and, therefore, a higher cost of forest carbon. For tropical forest countries and jurisdictions to prioritize avoided deforestation and forest degradation over other land uses, they should be offered a fair, break-even, or higher price for their emissions reductions.

4 The World Economic Forum, in collaboration with McKinsey, reports a potential of 3.6 GtCO2 per year by 2030 between avoided deforestation and peatland impact. See https://www.weforum.org/reports/nature-and-net-zero

3. CARBON MARKETS AND FOREST CARBON

Carbon markets provide a mechanism for private finance to support avoided deforestation and forest restoration. The value of the global voluntary carbon market quadrupled from 2020 to 2021. During this same period, trading in credits from forestry and land-use projects in the voluntary carbon market reached almost USD 1.7 billion, for more than 285 million tCO2e (FTEM 2022). All credits transacted are from project-based REDD+, as jurisdictional REDD+ is not yet available in the marketplace.

The average price of REDD+ credits on voluntary carbon markets has increased from $3.9/tCO2 in 2019 to $4.7/tCO2 in 2021. The share of REDD+ on the voluntary carbon market also went up from about 30 percent in 2019 to 40 percent in 2021 (Forest Trends 2021; Trove Research 2021). Afforestation, reforestation, and improved forest management projects typically earn higher prices due to the higher costs involved, as well as the misperception that carbon removal is more valuable than emissions reductions.
The volume of carbon traded on the voluntary carbon market is expected to increase 5 to 15 times by 2030. Pro-rating the same share of REDD+ on the voluntary carbon market as in 2021, the volume of forest carbon transactions could reach up to 500 million tCO2/year. 5

Trove considers a future voluntary carbon market demand in the context of corporate climate commitments, drawing from 350 corporations in the SBTi dataset (Trove Research 2021). Until now, just a few corporations have included forest carbon emissions or removals in their emissions targets. The SBTi Forest, Land, and Agriculture project (SBTi FLAG) could address this gap. The new methodology should enable corporations to set science-based targets that fully incorporate deforestation and land-related emissions and may also trigger a significant increase in REDD+ demand in the near future.

Momentum for net-zero greenhouse gas emissions by 2050 is building among investment managers as well as companies. In the financial sector, The Net Zero Asset Managers Initiative represents firms managing more than $43 trillion of assets. Investment managers are witnessing a rapid evolution in climate metrics, which can help investors prioritize low-carbon strategies. Investor demand for carbon credits to achieve net-zero, and as a supplement to lower carbon and climate transition portfolios, should emerge in the coming years, reinforcing corporate action and providing an additional boost to REDD+ demand (Edwards 2021).

Neither the price currently paid for forest carbon nor the volume of REDD+ transactions in carbon markets is in line with the goal of the Paris Agreement to keep global temperature increase below 1.50C. The discussion on REDD+ costs in the section above and in the Trove analysis suggests that meeting this goal would require increasing the price of forest carbon to at least $20 to 50 /tCO2 by 2030,[6] with a corresponding increase in volume. After 2030, the annual average supply (on both compliance and voluntary markets) would reach 1.5 - 2.5 Gt CO2 (Fuss et al. 2021).

The predominant profit-driven behavior of corporations will require clear economic incentives to invest in forest carbon. Many corporations will be more inclined to buy high-quality forest carbon emissions reductions under mandatory compliance regimes rather than for voluntary reasons. This would require REDD+ credits to be permitted to meet a percentage of compliance targets for countries and corporations.

Understanding the inevitability of climate action could motivate corporations to secure a long-term supply of REDD+ in order to control and manage the costs of transitioning to net zero (Golub et al. 2018; Golub et al. 2021). Corporations may also become inclined to buy call options on REDD+ credits giving the buyer the option, but not the obligation, to buy the credits at an agreed upon price, within a specific time frame, to hedge the risk of carbon prices abruptly rising in the future.[7]

5 This is calculated based on Trove (Trove Research 2021).

6 «If the financing of voluntary projects is to reduce emissions beyond those that would otherwise have occurred genuinely, today›s average prices of $3-5/tCO2e will need to increase to $20-50/tCO2e by 2030 and potentially to $100/tCO2e if governments undertake lower-cost projects first. Prices are then expected to keep rising to 2050." (see: https://trove-research.com/wp-content/uploads/2021/06/Trove-Research-Carbon-Credit-Demand-Supply-and-Prices-1-June-2021.pdf (p.2).

7 See Golub et al. 2018, for more information.

4. DISTINGUISHING CREDITS FROM PROJECT-BASED REDD+ AND JURISDICTIONAL REDD+

As mentioned above, the REDD+ prices and volumes traded in the voluntary carbon market to date arise from project-based REDD+. These projects are run by a broad array of project developers or "suppliers," including for-profit and non-profit entities, and they cover relatively small areas to address local drivers of deforestation and degradation. Credits are transacted between buyers and sellers through bilateral, over-the-counter deals or via a growing number of exchanges.

Jurisdictional REDD+ works at much larger geographic scales (sub-national or national level). To date, jurisdictional REDD+ has not been part of market-based systems that involve the creation of tradable credits, in which buyers claim emissions reductions as their own, but that is changing. As detailed in Box 2, there are several standards for jurisdictional REDD+.

BOX 2

ACCOUNTING AND CREDITING STANDARDS

Accounting and crediting standards play an essential role in producing high-quality forest carbon. In addition to the methodological framework of the Forest Carbon Partnership Facility and the scorecard of the Green Climate Fund, there are three standards applicable to jurisdictional REDD+ which are consistent with United Nations Framework Convention on Climate Change (UNFCCC) decisions, including the Warsaw Framework and Cancún Safeguards. These include the REDD+ Environmental Excellence Standard (ART-TREES), Verra's Jurisdictional and Nested REDD+ Framework (JNR), and the California Tropical Forest Standard (CTF).

ART-TREES specifies a jurisdictional and national scale as an eligibility criterion[8], while JNR provides an accounting and verification framework for jurisdictional REDD+ programs and nested projects[9]. The CTF provides assessment criteria for jurisdictions seeking to link their REDD+ programs with California's cap-and-trade program[10].

ART-TREES and the JNR framework were designed to serve multiple markets, while the purpose of the CTF is to allow REDD+ credits into the California carbon market. ART-TREES and CTF standards specify formal procedures for computing high-quality emissions reductions, while the JNR proposes a context-specific crediting mechanism.

The CTF requires a crediting baseline at least 10 percent below the reference level (10-year average historical emissions) that linearly declines to a jurisdictional-specific 2050 GHG emissions target for the forest sector. The ART-TREES reference period for the crediting is five years of the average historical emissions, to be updated every five years, creating an "endogenous" baseline, while JNR establishes it at four to six years. All standards are intended to prevent leakages, address risks of non-permanence, and account for uncertainty.

Nesting has emerged as an avenue to include REDD+ projects into jurisdictional programs. A nesting approach aims to embed smaller projects into larger jurisdictional programs, as well as sub-national programs into national programs. A key challenge in nesting remains to align accounting and reporting of emissions at jurisdictional and project levels, and in particular, reconciling project-level baselines with jurisdictional-scale baselines. The World Bank has released guidance for policymakers on nesting, providing practical advice to develop nesting approaches for REDD+ initiatives (World Bank Group 2021).

The aim of ensuring high-quality of emissions reductions has cost implications. A participating country or jurisdiction must first meet the additionality criteria by reducing emissions below that of the baseline. It must then deduct additional emissions reductions to create a buffer against risks, uncertainty and leakage. Only the emissions reductions remaining after these deductions can be traded on the market [11]. Complying with high-quality standards, therefore, increases the cost of ERs eligible for a transaction because it should also account for the cost of delivering the ERs that have been deducted. The use of dynamic baselines, which become more stringent as ERs are achieved, means that the cost of high-quality ERs will also increase over time.

8 https://www.artredd.org/trees-2-0/

9 https://verra.org/project/jurisdictional-and-nested-redd-framework/

10 https://ww2.arb.ca.gov/sites/default/files/classic/cc/ghgsectors/tropicalforests/ca_tropical_forest_standard_english.pdf

11 For example, jurisdictions may face deductions of 30 to 40 percent to account for uncertainty, leakage, and non-permanence risks. Then, to sell 1 tCO_2e, a seller should reduce emissions by about 1.4 tCO_2 relative to the previous five years' average historical emissions. Furthermore, the next five years' worth of already reduced emissions will then constitute a new reference line for ERs crediting.

5. INNOVATIVE PRICING INSTRUMENTS

Innovative pricing instruments can help mobilize finance for REDD+ implementation and play a critical role in increasing the efficiency of the limited public finance available to support REDD+.

Funding commitments in the form of "put options" give a right, but not the obligation, to sell ERs at a set price within a specific timeframe. Put options on REDD+ could have a powerful leverage effect on private investment while allowing public funds to be recycled and leverage even more private finance.

There are precedents of public actors using put options for carbon finance. Over the last few years, they have successfully been used by the World Bank Pilot Auction Facility for methane and nitrous oxide emissions reductions from projects developed by private actors under the CDM[12] (Bodnar et al. 2017). In the context of REDD+, the set price of the put option represents a guaranteed revenue stream to the REDD+ supplier. The revenue stream, however, is contingent on performance. The REDD+ supplier can exercise the put option at the agreed price, only if the ERs have been achieved.

For example, let us assume a situation where a put option has been agreed upon at $10/tCO2e. Let us also assume that by the time the put option expires, the market price is $25/tCO2, which is $15 above the set price of the option ($10/tCO2). The best choice for the REDD+ supplier would then be to let the put option expire and sell the ERs on the market. In this case, the public funds earmarked for the option could be recycled and used to leverage more investments in REDD+. On the other hand, if the market price is below $10/tCO2, the REDD+ supplier may choose to exercise the put option, receiving the pre-agreed price of $10/tCO2.

Such flexibility to sell ERs at higher prices would further increase the value of conserving forests (Golub et al. 2018). The put options on REDD+ would support the development of financing instruments to deliver lower-cost, upfront capital investment, such as enhanced bond structures explicitly linked to REDD+ (Edwards et al. 2014; Nepstad et al. 2015; World Bank 2017; Golub et al. 2021).

Another opportunity is given by call options, which are also a way to collect upfront payments while preserving the opportunity to obtain higher prices for ERs later. In a call option, a jurisdiction must sell ERs at the negotiated set price if the buyer of the call option decides to execute the contract. A relatively high set price under the contract protects the jurisdiction from prohibitively low prices for ERs. If the market price is below the pre-agreed set price and the call option contract expires, the jurisdiction keeps the ERs. The jurisdiction may sell them later when a higher price becomes available.

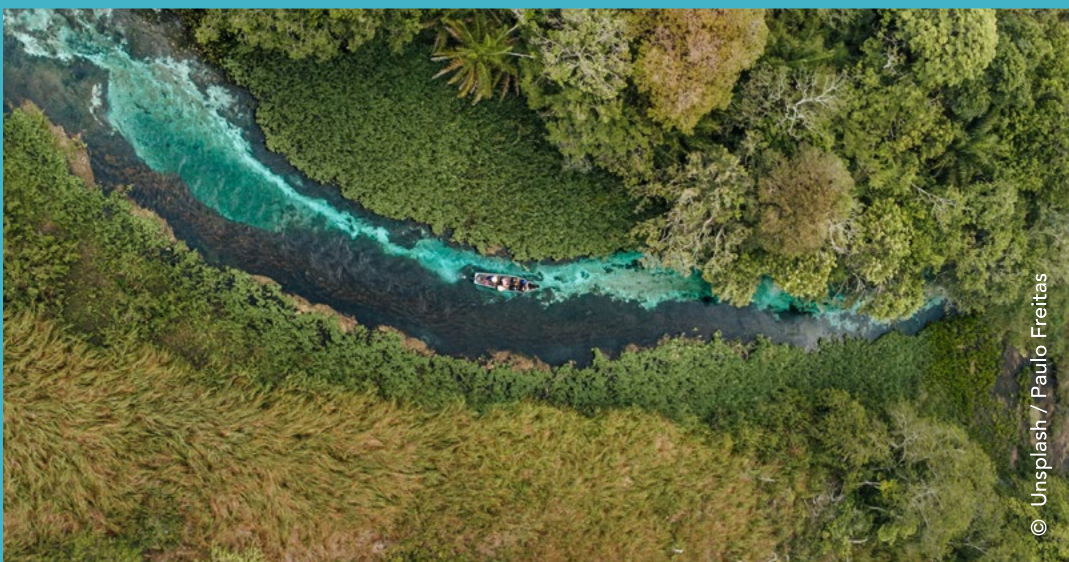
12 For more information on the Pilot Auction Facility, see https://www.pilotauctionfacility.org)

BOX 3

APPLYING INNOVATIVE PRICING AND FINANCE INSTRUMENTS FOR REDD+: THE CASE OF MATO GROSSO

Let us assume that a REDD+ program in Mato Grosso to avoid the loss of one million hectares of forest by 2030 requires an investment of about $726 million, including implementation and financial costs[13]. The successful implementation of the program would produce 387 million tons of high-quality ERs. Put options for 73 million tCO2 with a $10/tCO2 strike price would reduce financial risks by guaranteeing a $730 million return on investment[14]. This would create conditions to use other instruments like low-risk bonds. If prices are low, the jurisdiction may exercise put options by selling REDD+ ERs generated through the program. If the market price is higher than $10/tCO2, the jurisdiction can choose to trade ERs on the market.

Now, consider a situation in which Mato Grosso has call options on 200 million tCO2 with a set price of $30/tCO2, an expiration time of five years, and a premium paid upfront at $20/tCO2. The initial proceeds of $400 million US would create enough leverage to raise the remaining capital needed to implement the REDD+ program. Now, the jurisdiction has an obligation to sell REDD+ ERs if the buyer decides to exercise the call options. Let us assume that the market price reaches $40/tCO2, thus going above the agreed upon price for the call option. In this case, the jurisdiction receives $6 billion and would also have a remaining pool of ERs worth $7.5 billion. If, on the other hand, the carbon price is $29/tCO2, call options expire and the jurisdiction keeps a pool of ERs worth $11.2 billion.



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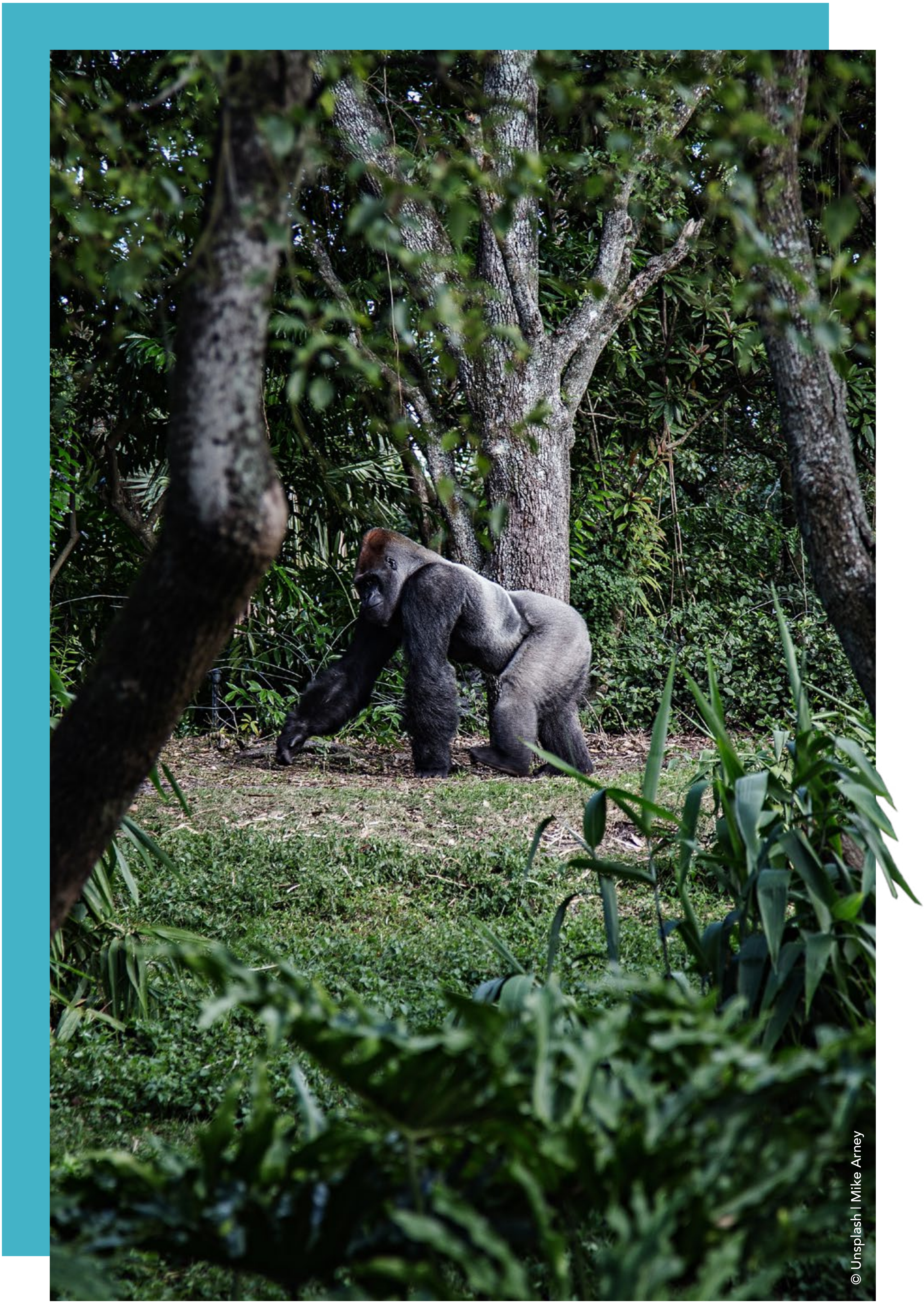
13 This example is based on a pre-feasibility study supported by EDF. (Golub et al. 2021.)

14 Note that this does not eliminate risks related to non-performance. ERs should be achieved in the first place.

6. CONCLUDING REMARKS

Nature-based Solutions, such as forests, could account for one-third of the abatement required to prevent the risk of catastrophic climatic events. An expansion of voluntary carbon markets and the adoption of high integrity standards for jurisdictional REDD+ are the first steps in ramping up forest carbon transactions. Over the longer-term, REDD+ emissions reductions could become fungible assets in the emerging global compliance market to close the emissions gap to meet the global 1.50C target. As such, REDD+ can provide a pathway for tropical forest countries to receive a fair share of benefits associated with the full inclusion of forests in global mitigation efforts.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