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JUSTIFICATION FOR HIGH FOREST, LOW DEFORESTATION CREDITING

How Jurisdictional HFLD Credits Meet Integrity and Additionality Thresholds for Fungibility

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Environmental Defense Fund

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Justification for HFLD Crediting

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Abstract

This paper details the supporting arguments and evidence for why conservatively issued jurisdictional-scale high forest, low deforestation (HFLD) credits are high-integrity and should be considered fungible with any other high-integrity emissions reduction or removal credits. In particular, this paper explains why HFLD credits are additional, focusing on the emissions that would be expected to occur in the absence of the crediting mechanism.

Key Words

Deforestation, high forest, low deforestation, HFLD, tropical forests, Indigenous Peoples, carbon credits

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Introduction

High forest, low deforestation (HFLD) jurisdictions are essential to maintaining the stability of the global climate system, fostering high levels of ecosystem integrity, and supporting the livelihoods of Indigenous Peoples and other forest-dwelling communities. That is why it is pivotal that HFLD jurisdictions have access to finance, including through the issuance of conservatively issued jurisdictional-scale HFLD credits. Colloquially, crediting HFLD jurisdictions is a means of recognizing and supporting success stories, anticipating and neutralizing risks to forests, rather than perversely waiting until deforestation occurs and then rewarding efforts to stop the damage.

This paper details the supporting arguments and evidence for why conservatively issued jurisdictional-scale HFLD credits are high-integrity and should be considered fungible with any other high-integrity emissions reduction or removal credits. In particular, this paper explains why **HFLD credits are additional**, focusing on the emissions that would be expected to occur in the absence of the crediting mechanism.

The main arguments are as follows:

1. Deforestation happens in HFLD jurisdictions. Forests in HFLD jurisdictions are currently at risk and their emerging threats shift rapidly.
2. Reducing deforestation and conserving forest carbon stock requires active and ongoing intervention.
3. The existing HFLD crediting methodology (TREES) is sufficiently conservative to avoid the risk of over-crediting.
4. High-quality HFLD crediting further strengthens conservativeness and rigor of forest carbon crediting, as it addresses risks of international leakage and perverse incentive to deforest.

Forests in HFLD jurisdictions are at risk and their emerging threats shift rapidly.

High forest, low deforestation status is not a permanent land classification; it represents a moment in time. According to one widely used definition, HFLD countries have at least 50% forest cover and experience deforestation, though at a lower rate than the global average[1]. **There are six countries that *lost* HFLD status[2] over the preceding decade (2010-2019): Cambodia, Colombia, Laos, Samoa, Sao Tome and Principe, and Zambia.** Again, these six countries were previously classified as HFLD, and in the span of 10 years lost that classification, indicating that HFLD status cannot be taken for granted or expected to continue indefinitely without ongoing intervention.

The **theory of forest transition**, first articulated in 1992, states that as countries proceed through economic development, forest cover first declines precipitously, and then slightly increases, stabilizing at a lower level[3,4]. Figure 1 below illustrates this theory, showing the general trajectory over time of countries from high forest, low deforestation (HFLD) to low forest, no deforestation (LFND). This pattern has played out all over the world repeatedly. As forest cover initially declines, the rate of deforestation itself increases (forest is lost *faster*).[5] It is critical to intervene before the deforestation rate speeds up and countries transition to high forest, *high* deforestation status. REDD+ was designed to short-circuit this path, so that countries do not need to sacrifice their forests in order to achieve economic growth. Indeed, the world cannot afford to allow the emissions that would occur if forest loss takes place in remaining forests – this would push global warming past the limits imposed by the Paris Agreement. Thus, REDD+ offers an alternative that helps countries, including HFLD jurisdictions, undergo a sustainable economic development pathway while also preserving the world's ability to meet its climate goals.

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[1] A value of 0.296% based on FAOSTAT data from 2000-2010. This definition is based on a 10-year historical average rate approach presented in da Fonseca, GAB. et al. (2007). No Forest Left Behind. *PLoS Biol, 5*(8), e216. https://doi.org/10.1371/journal.pbio.0050216

[2] HFLD status was lost due to lower forest cover than the 50% threshold or due to a higher deforestation rate than the global average, using the da Fonseca et al (2007) approach, with an updated average global deforestation rate of 0.263% based on FAOSTAT data from 2009-2019, presented in World Bank Group. (2021). Options for conserving stable forests. http://documents1.worldbank.org/curated/en/541251635971110855/pdf/Options-for-Conserving-Stable-Forests.pdf

[3] Mather, A. (1992). The Forest Transition. *Area, 24*(4), 367-379. https://www.jstor.org/stable/20003181

[4] Mather, A. & Needle, C. (1998). The Forest Transition: A Theoretical Basis. *Area, 30*(2), 117–124. www.jstor.org/stable/20003865

[5] Forest loss since 2001 in the Peruvian Amazon by region shows this pattern of increasing deforestation rates in the first stages of forest cover loss, as described by the forest transition curve (https://geobosques.minam.gob.pe/geobosque/view/perdida.php)

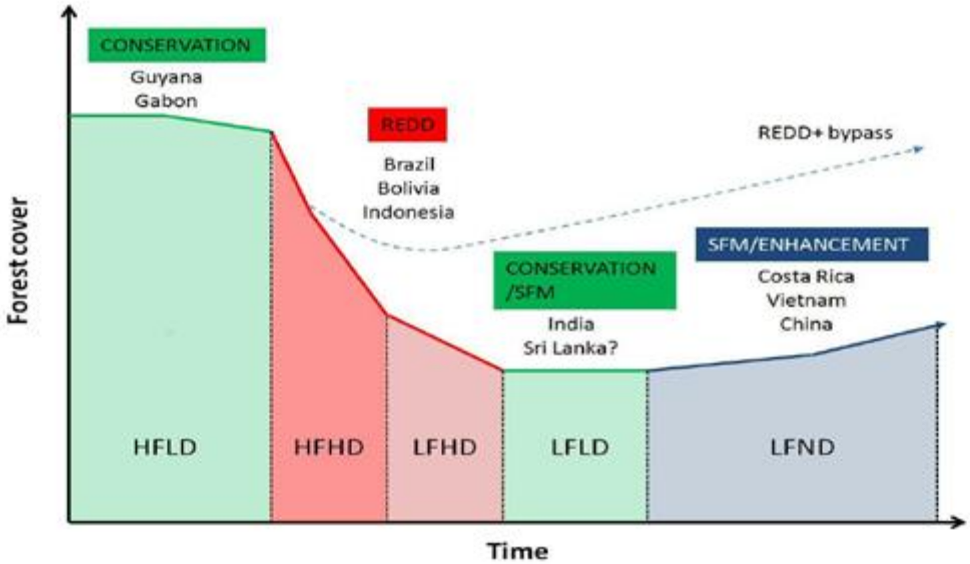

Figure 1: Visual representation of forest transition theory.[6]

Under business-as-usual projections, deforestation is expected to increase across the tropics[7], raising an urgent need to preserve forest stocks. Modeling projections, calibrated with historical patterns of deforestation, predict that deforestation will rise in Latin America and Africa and stay roughly constant in Asia over the next 15 years in the absence of economic incentives for forest conservation[8]. **Even areas where deforestation has been historically low are poised to be under threat in the future if incentives for sustainable development do not emerge.**[9] For example, the agricultural frontier in Brazil has inexorably advanced into areas of dense forest (Amazon) and the Cerrado[10], leading to the loss of previously untouched forests.

[6] Mattsson, Eskil. (2012). Forest and land use mitigation and adaptation in Sri Lanka - Aspects in the light of international climate change policies. https://www.researchgate.net/publication/260487383_Forest_and_land_use_mitigation_and_adaptation_in_Sri_Lanka_-_Aspects_in_the_light_of_international_climate_change_policies

[7] Busch, J. & Engelmann, J. (2017). Cost-effectiveness of reducing emissions from tropical deforestation, 2016–2050. *Environmental Research Letters, 13,* 015001. https://doi.org/10.1088/1748-9326/aa907c

[8] ibid

[9] Mather, A. & Needle, C. (1998). The Forest Transition: A Theoretical Basis. *Area, 30*(2), 117–124. www.jstor.org/stable/20003865

[10] https://research.wri.org/gfr/forest-extent-indicators/deforestation-agriculture

Intact forests ***are*** under threat. The main drivers of forest loss in intact tropical forests are timber harvesting, agricultural and pasture expansion, and mining[11] – the same forces that are increasing deforestation rates worldwide as encroachment becomes more widespread and infrastructure and extractive activities extend into previously remote areas. Over the last two decades (2000-2020), 12% of *intact* forest landscapes have been lost, or about 0.6% per year[12]. The rate of global *primary* tropical forest loss has accelerated in recent years, increasing by 12% from 2019 to 2020 and trending higher than the previous two decades[13]. *Emissions* from primary tropical forests accounted for 22% of all forest emissions during the period 2000-2019[14].

Examples from across the globe show how quickly previously intact ecosystems can come under threat.

"In the 2000s, surging demand for animal feed, combined with development of more robust soybean varieties, triggered the wholesale conversion of some Amazonian landscapes to soybean fields.[15] An economic crisis in the late 2000s, triggered by the real estate market and other factors, caused a sharp rise in the price of gold, suddenly making remote deposits of gold economically viable to recover. This led to incursions of gold mining operations in Guyana and Suriname, as well as the devastation of forested river systems in Peru.[16,17] Later, rising demand for cooking oil in Asia contributed to the explosion of oil palm plantations in Indonesia and Malaysia, which soon spilled into parts of Africa and South America.[18,19,20,21] In

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[11] Potapov, P. et al. (2017). The last frontiers of wilderness: Tracking loss of intact forest landscapes from 2000 to 2013. *Science Advances, 3*(1). https://doi.org/10.1126/sciadv.1600821
[12] Potapov, P. et al. (2017). The last frontiers of wilderness: Tracking loss of intact forest landscapes from 2000 to 2013. *Science Advances, 3*(1). https://doi.org/10.1126/sciadv.1600821; data updates through 2020 can be found here: https://www.intactforests.org/world.map.html
[13] Weisse, M. & Goldman, L. (2021). Primary Rainforest Destruction Increased by 12% from 2019 to 2020. Global Forest Watch. https://www.globalforestwatch.org/blog/data-and-research/global-tree-cover-loss-data-2020/
[14] Harris, N.L. et al. (2021). Global maps of twenty-first century forest carbon fluxes. *Nature Climate Change, 11*, 234–240. https://doi.org/10.1038/s41558-020-00976-6
[15] Morton, D. et al. (2006). Cropland expansion changes deforestation dynamics in the southern Brazilian Amazon. *PNAS, 103*(39), 14637-14641. https://doi.org/10.1073/pnas.0606377103
[16] Dezécache, C. et al. (2017). Gold-rush in a forested El Dorado: deforestation leakages and the need for regional cooperation. *Environmental Research Letters, 12*(3), 034013. https://doi.org/10.1088/1748-9326/aa6082
[17] Caballero Espejo, J. et al. (2018). Deforestation and forest degradation due to gold mining in the Peruvian Amazon: a 34-year perspective. *Remote Sensing, 10*(12), 1903. https://doi.org/10.3390/rs10121903
[18] Heilmayr, R. et al. (2020). Deforestation spillovers from oil palm sustainability certification. *Environmental Research Letters, 15*(7), 075002. https://iopscience.iop.org/article/10.1088/1748-9326/ab7f0c
[19] Taheripour, F. et al. (2019). Market-mediated responses confound policies to limit deforestation from oil palm expansion in Malaysia and Indonesia. *PNAS, 116*(38), 19193-19199. https://doi.org/10.1073/pnas.1903476116
[20] Vijay, V. et al. (2018). Deforestation risks posed by oil palm expansion in the Peruvian Amazon. *Environmental Research Letters, 13*(11), 114010. https://doi.org/10.1088/1748-9326/aae540
[21] Qaim, M. et al. (2020). Environmental, economic, and social consequences of the oil palm boom. *Annual Review of Resource Economics, 12*, 321–44. https://doi.org/10.1146/annurev-resource-110119-024922

each case, deforestation suddenly appeared in previously untouched areas." (Paragraph from PPWP[22])

Extractive industries threaten intact forest landscapes (IFL), which can overlap with HFLD designation. These industries include mining and oil and gas projects, which are given concessions by governments. About 20% of tropical intact forests are currently designated as extractive concessions meaning they are facing a probable risk of being lost[23]. Since many of these concessions are in exploratory phases, there are opportunities for governments to influence how, if at all, concession activities get carried out (such as requiring environmental impact assessments, mandating safeguards, etc.). Extractive industries can be important economic drivers in developing countries, so providing an alternative financing incentive to preserve IFLs and HFLD overlap areas, rather than deforest and extract them, is key for encouraging economic and climate progress in tandem.

Already 70% of the world's forests lie within one kilometer of a forest edge[24]. Forest edges are growing exponentially: for each hectare of intact forest cleared, seven hectares of forest edges are created[25]. Degradation of forest edges is a precursor of forest loss. While forest degradation, such as from selective logging, is more challenging to measure than deforestation, the lower carbon storage in forest edges captures the creeping detrimental effects of forest degradation[26]. Lower carbon storage in forest edges, combined with their current exponential growth, is evidence of incremental threats in what appear to be intact forest landscapes. Monitoring, preventing, and reversing degradation are examples of the vital activities that HFLD jurisdictions carry out before emissions from deforestation get alarmingly high.

Clearly, forests in HFLD areas are at risk – and the risk is tied to ongoing global drivers of deforestation, rather than their historical status. Protecting forests from global and local drivers of deforestation requires ongoing and dynamic efforts. In the absence of these efforts, the risk of losing forest carbon stocks increases. This risk can be estimated, and its statistical effect on

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[22] Climate Impact X, Conservation International, Emergent, Natural Climate Solutions Alliance, & Wildlife Conservation Society. (2022). Preserving Forests in High Forest, Low Deforestation Jurisdictions. https://uploads-ssl.webflow.com/6230bcdb48cea9dee3e38a3b/6364a0409c173f32c46a30ee_Whitepaper%20-%20Project%20Preservation.pdf

[23] Grantham, H.S. et al. (2021). The emerging threat of extractives sector to intact forest landscapes. *Frontiers in Forests and Global Change, 4*. https://doi.org/10.3389/ffgc.2021.692338

[24] Haddad, N.M. et al. (2015). Habitat fragmentation and its lasting impact on Earth's ecosystems. *Science Advances, 1*(2). https://www.science.org/doi/10.1126/sciadv.1500052

[25] Maxwell, SL. et al. (2019). Degradation and forgone removals increase the carbon impact of intact forest loss by 626%. *Science Advances, 5*(10). https://doi.org/10.1126/sciadv.aax2546

[26] Chaplin-Kramer, R. et al. (2015). Degradation in carbon stocks near tropical forest edges. *Nature Communications, 6*, 10158. https://doi.org/10.1038/ncomms10158

reducing emissions can be quantified and translated into tons of CO_2e. This allows for the comparison between the emissions that would occur with protection efforts versus emissions without these efforts. The difference represents and confirms the additionality of the reduced emissions. Economic development is path-dependent: if deforestation-driving industries take hold in HFLD regions, then deforestation will continue as supply chains expand, crowding out other industries and closing the opportunity to receive financing for conserving standing forests. REDD+ financing gives HFLD countries access to an alternative path: low-deforestation green economic growth.

The conservation of forest carbon stock requires active and ongoing intervention.

Many Indigenous lands fall within the HFLD designation due to persistent efforts by Indigenous peoples and local communities. Despite growing pressures from encroaching deforestation activities, Indigenous lands have remained largely intact and in good ecological conditions[27,28]. **In fact, these territories have maintained lower deforestation rates than other forest areas through ongoing forest conservation efforts[29]**. Legal demarcation of territories, along with land rights, are a tool to resist the predatory expansion of the frontier and to stabilize carbon stocks[30,31]. Without land title or active protection, much of these forest areas would likely have been lost, especially due to land grabbing, logging, mining, and infrastructure projects. This has been shown through analyses that compare the preservation of forests in Indigenous Territories to the loss of forest cover in adjacent areas.[32]

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[27] Fa, J.E. et al. (2020). Importance of Indigenous People's lands for the conservation of Intact Forest Landscapes. *Frontiers in Ecology and the Environment, 18*(3), 135-140. https://doi.org/10.1002/fee.2148

[28] WWF, UNEP-WCMC, SGP/ICCA-GSI, LM, TNC, CI, WCS, EP, ILC-S, CM, IUCN. (2021). The State of Indigenous Peoples' and Local Communities' Lands and Territories. https://wwflac.awsassets.panda.org/downloads/report_the_state_of_the_indigenous_peoples_and_local_communities_lands_and_territories_1.pdf

[29] FAO and FILAC. (2021). Forest Governance by Indigenous and Tribal People. An Opportunity for Climate Action in Latin America and the Caribbean. Santiago. https://doi.org/10.4060/cb2953en

[30] Walker, W.S. et al. (2015). Forest carbon in Amazonia: the unrecognized contribution of indigenous territories and protected natural areas. *Carbon Management, 5*(5-6), 479-485. https://doi.org/10.1080/17583004.2014.990680

[31] Alejo, C. et al. (2021). Are indigenous territories effective natural climate solutions? A neotropical analysis using matching methods and geographic discontinuity designs. *PLoS ONE, 16*(7), e0245110. https://doi.org/10.1371/journal.pone.0245110

[32] Walker, W.S. et al. (2020). The role of forest conversion, degradation, and disturbance in the carbon dynamics of Amazon indigenous territories and protected areas. *PNAS, 117*(6), 3015-3025. https://doi.org/10.1073/pnas.1913321117

There is causality in the actions of Indigenous Peoples addressing deforestation by intervening with its drivers (enhanced frequency of monitoring and enforcement; territorial border patrol; political representation and legal land rights – all actions that ensure minimal harvesting of forest resources). Since the early 2000s, there has been improved remote sensing and field based monitoring of Brazilian Indigenous Territories. These interventions are used to consistently mobilize enforcement activities against encroachment. Considering that 36% of the world's remaining intact forest landscapes are located on Indigenous land, the actions taken by these communities to date illustrate successful methods to prevent forest loss.

Beyond the many Indigenous forest conservation examples, jurisdictions that are designated as HFLD also develop and implement REDD+ strategies to address pressures on standing forests. HFLD jurisdictions, such as Guyana[33] and Gabon[34], implement many of the same REDD+ activities as non-HFLD jurisdictions (e.g. enacting forest management plans and codes of practice, establishing protected areas, developing REDD+ regulation and policies, limiting logging concessions, establishing forest monitoring systems that can identify emerging threats, enforcing against encroachment, etc.). While such actions are generally considered additional when practiced by non-HFLD jurisdictions to *lower* their deforestation, they are falsely interpreted as non-additional when practiced by HFLD jurisdictions to *maintain* their low levels of deforestation. In both instances similar jurisdictional activities are implemented to conserve existing forest carbon stocks and address the drivers of forest loss - the HFLD jurisdictions simply start from a point of lower deforestation.

The effectiveness and necessity of national approaches to resist fluctuating pressures from extractive industries are highlighted in an analysis of Guyana's REDD+ program from 2010-2015. Researchers simulated the potential effect of commodity price fluctuations on deforestation. The study then compared these simulations with the empirical measurements of deforestation during the time period when Guyana was implementing REDD+ interventions to dampen these forest loss pressures. The study found that Guyana's REDD+ program reduced tree cover loss by 35% and that tree cover loss increased when the program ended.[35]

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33 Guyana's TREES Monitoring Report (2022), accessed from ART Registry https://art.apx.com/mymodule/ProjectDoc/Project_ViewFile.asp?FileID=84&IDKEY=olksjoiuwqowrnoiuomnckjashoufifmln902309ksdflku0980115836

34 Gabon's Proposed Modified National REDD+ Forest Reference Level (Oct 2021) https://redd.unfccc.int/files/gabon_frl_modified_oct2021_clean_final.pdf

35 Roopsind, A. et al. (2019). Evidence that a national REDD+ program reduces tree cover loss and carbon emissions in a high forest cover, low deforestation country. *PNAS, 116*(49), 24492-24499. https://doi.org/10.1073/pnas.190402711

Financing HFLD jurisdictions, including in the form of HFLD crediting, helps prevent deforestation, reduce emissions, and contribute to achievement of the Paris Agreement goals, as formally recognized in Article 5 of that agreement. Forests *actively* benefit the atmosphere, and the actions of communities within HFLD jurisdictions provide critical ongoing conservation activities that reduce emissions. As a framework, the defining activities of REDD "+" include "the conservation of forest carbon stocks" as one element of a comprehensive approach to managing forest emissions. Jurisdictional standards that incorporate HFLD crediting methodologies are designed for this context.

Existing HFLD crediting methodology (TREES) is sufficiently conservative to avoid the risk of over-crediting.

HFLD credits reward jurisdictions for resisting drivers of deforestation and protecting high forest carbon stocks, thus preventing forest carbon from being emitted. HFLD credits represent emission reductions because they are issued through a conservative quantification of the emissions that would have occurred in the absence of ongoing interventions.

Eligibility for earning these credits is not automatic for HFLD jurisdictions under TREES[36]. If emissions from deforestation and degradation rise, fewer HFLD credits will be issued, up to the point that the jurisdiction loses its eligibility to earn HFLD credits at all. Thus, a well-designed HFLD methodology encourages active intervention to preserve the ability to keep earning credits, serving as an incentive to maintain consistently low rates of forest loss. HFLD crediting requires the same discounts as non-HFLD crediting for leakage, uncertainty, and reversals, along with REDD+ implementation plans to mitigate drivers of deforestation and degradation. HFLD crediting methodologies provide a pathway to recognize and support HFLD jurisdictions, which wouldn't otherwise earn REDD+ credits nor finance for their continuous efforts in the face of growing threats to forests.[37]

The incremental atmospheric benefit of intact tropical forests (the *additional* carbon storage that occurs as they remain standing) is estimated to be 2.6 tCO_2e/ha/yr, or about 0.3% of

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[36] https://www.artredd.org/wp-content/uploads/2021/12/ART-HFLD-Primer.pdf

[37] Funk, J. et al. (2019). Securing the climate benefits of stable forests. *Climate Policy, 19*(7), 845-860. https://doi.org/10.1080/14693062.2019.1598838

average carbon stock per hectare in tropical forests[38,39,40,41]. TREES uses a conservative factor to calculate the HFLD crediting level (up to 0.05% of standing forest carbon stock) and requires additional deductions to be applied. This means that any given jurisdiction's final HFLD crediting volume will underestimate the climate benefit that its forests are providing.

For example, Guyana recently received TREES HFLD credits for its 2016-2020 REDD+ performance[42]. The emission reduction results are partly calculated as a function of Guyana's vast forest area of over 18 million hectares, hosting about 17 billion tons CO_2e. This total forest carbon stock value is adjusted to 6.8 million tons of CO_2e[43] on top of Guyana's actual emissions from deforestation and degradation. The conservative HFLD adjustment portion of the crediting methodology implies that Guyana's actions prevented an extra 6.8 million tons of CO_2e per year in emissions, which reflects an additional area of 7,000 or so hectares being protected from loss and thus credited for being under threat – roughly the area that is deforested every year in Guyana due to gold mining[44]. Thus, in addition to lowering its average annual emissions, Guyana received credits for conserving only a tiny fraction of its vast 18 million hectare accounting area.

Protecting intact forests provides additional carbon benefits beyond those recognized for crediting under TREES. Intact forest landscapes sequester more carbon and protect further loss of carbon nearby. In fact, the climate impact of preserving these forests is many times larger than the volume of credits generated.[45] One study[46] estimated that while clearing of intact forests directly accounted for 3.2% of gross carbon emissions from all tropical deforestation, the full net carbon impact of intact forest destruction was at least six times greater, due to a cascade

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38 Baccini, A. et al. (2017). Tropical forests are a net carbon source based on aboveground measurements of gain and loss. *Science, 358*(6360), 230-234. https://doi.org/10.1126/science.aam5962
39 Pan, Y. et al. (2011). A large and persistent carbon sink in the world's forests. *Science, 333*(6045), 988-993. 10.1126/science.1201609
40 Phillips, O.L. et al. (2009). Changes in Amazonian forest biomass, dynamics, and composition, 1980-2002. *Amazonia and Global Change, 186*, 373-387. https://doi.org/10.1029/2008GM000739
41 Baker, T.R. et al. (2004). Increasing biomass in Amazonian forest plots. *Phil Trans Royal Society B, 359*, 353-365. https://doi.org/10.1098/rstb.2003.1422
42 https://www.artredd.org/wp-content/uploads/2022/12/ART-Issues-Worlds-First-Jurisdictional-Forestry-TREES-Carbon-Credits-to-Guyana.pdf
43 See Guyana's TREES Registration Document for HFLD calculations and stock density factor https://art.apx.com/mymodule/ProjectDoc/Project_ViewFile.asp?FileID=88&IDKEY=k8723kjnf7kjandsaslmdv09887vaksmrmnwqkjoiuanfnfuq0o121352
44 Guyana Forestry Commission. (2021). Guyana REDD + Monitoring Reporting and Verification System (MRVS) Report. Assessment Year 2020. https://forestry.gov.gy/wp-content/uploads/2021/10/Guyana-MRVS-Assessment-Year-2020-Report-Final-September-2021.pdf
45 Seymour, F. (2021). Why are tropical forests being lost, and how to protect them. https://research.wri.org/gfr/tropical-forests-loss-deforestation-protection
46 Maxwell, SL. et al. (2019). Degradation and forgone removals increase the carbon impact of intact forest loss by 626%. *Science Advances, 5*(10). https://doi.org/10.1126/sciadv.aax2546

of concomitant emissions that follow deforestation of these important forest areas. By preventing the destruction of intact forest ecosystems, HFLD jurisdictions deliver a larger-than-realized mitigation benefit from preventing the loss of remaining intact forests. Another recent study[47] shows that when the non-carbon effects (e.g., albedo, evapotranspiration, surface roughness, and aerosols) are accounted for, protecting tropical forests provides a 50% global cooling bonus compared to carbon effects alone. Thus, the best available science suggests that HFLD crediting *underestimates* the true climate benefit delivered by these forests.

The TREES HFLD methodology uses a conservative[48], static equation to estimate the amount of carbon at risk from underlying drivers. Hence the amount of credits generated when forests are protected does not account for temporal or spatial differences in drivers of deforestation. In reality, risks to forest carbon can vary due to proximate factors (e.g., a new road is built nearby) or temporal changes in global drivers (e.g., as when increases in the price of gold drove new illegal mining in Guyana and Peru). As a result, the low level of credits generated under the current TREES HFLD approach almost certainly underestimates the amount of carbon that is truly at risk and would be lost in the absence of protective actions. Further revisions may fine-tune crediting to account for these factors, yielding a more accurate estimate of emissions prevented by such actions – and likely generating higher volumes of credits in some places.

HFLD crediting addresses known problems that occur in systems where only non-HFLD ERRs are credited: international leakage and perverse incentive to deforest.

Providing financial incentives to HFLD jurisdictions before they experience a spike in deforestation pressure is a crucial, cost-effective, and equitable way to protect forests at a global scale over the coming decade. When one project site or jurisdiction carries out actions to reduce existing deforestation, the drivers of deforestation can be displaced to new locations, often nearby. The displacement of emissions due to mitigation activities is known as leakage, and it can occur in any economic sector – and sometimes across sectors. Alarmingly, international

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[47] Seymour, F. et al. (2022). "Not Just Carbon: Capturing All the Benefits of Forests for Stabilizing the Climate from Local to Global Scales." Report. Washington, DC: World Resources Institute. https://doi.org/10.46830/wrirpt.19.00004
[48] In IPCC accounting, "conservative" describes a methodology that is systematically biased to avoid the risk of over-crediting reductions or underestimating emissions.

leakage in the forestry products industry has been estimated to be as high as 42-95%.[49] For forests, leakage can erode the effectiveness of efforts to control deforestation at a global scale, since success in one place can trigger new deforestation elsewhere. This is true of HFLD areas as much as anywhere else. The threat of deforestation moving from countries reducing loss to HFLD countries was flagged as early as 2007: "Without the opportunity to sell carbon credits, HFLD countries would be deprived of a major incentive to maintain low deforestation rates. Since drivers of deforestation are mobile, deforestation reduced elsewhere could shift to HFLD countries, constituting a significant setback to stabilizing global concentrations of greenhouse gases at the lowest possible levels."[50] Crediting HFLD jurisdictions helps to provide needed financial incentives that can counteract and dampen the effects of leakage.

Studies suggest that creating incentives to maintain carbon stocks in HFLD areas can be an effective solution to reduce the risk of leakage.[51,52] Such an approach also ensures that areas where deforestation is low and where ongoing efforts to reduce emissions have been succeeding (e.g., Indigenous Territories) are rewarded so that incentives are not only provided where emissions are high or rising, thus inadvertently rewarding poor performance. Otherwise, landowners would only be able to earn credits after deforestation had increased – a perverse and myopic outcome.

By definition, HFLD regions have maintained low rates of forest loss and have thus foregone revenue from logging and potential gains from alternative use of land. In addition, both public and private landowners incur direct costs to protect their forests against illegal encroachments, and private owners must also pay taxes. At the same time, economic development and increased revenue to improve social outcomes is an imperative in many HFLD jurisdictions. If HFLD jurisdictions are excluded from crediting, jurisdictions and landowners could become eligible to earn credits from emission reductions only after sufficient deforestation has occurred that the HFLD designation is withdrawn. This is a perverse climate outcome as well as highly inequitable for those communities that have protected their forests. This inequity has been widely recognized as a shortcoming of previous crediting standards; the TREES HFLD crediting approach aims to help remedy this problem.

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[49] Gan, J. & McCarl, B. (2007). Measuring transnational leakage of forest conservation. *Ecological Economics, 64*(2), 423-432. https://doi.org/10.1016/j.ecolecon.2007.02.032
[50] da Fonseca, GAB. et al. (2007) No Forest Left Behind. *PLoS Biol, 5*(8), e216. https://doi.org/10.1371/journal.pbio.0050216
[51] Roopsind, A. et al. (2019). Evidence that a national REDD+ program reduces tree cover loss and carbon emissions in a high forest cover, low deforestation country. *PNAS, 116*(49), 24492-24499. https://doi.org/10.1073/pnas.190402711
[52] Busch, J. et al. (2009). Comparing climate and cost impacts of reference levels for reducing emissions from deforestation. *Environmental Research Letters, 4*, 044006. https://doi.org/10.1088/1748-9326/4/4/044006

Aside from reducing leakage risk, offering a distinct HFLD methodology for countries with unique qualifying attributes[53] could also improve jurisdictional participation in REDD+ efforts and result in effective distribution of benefits to relevant actors. Busch et al. (2009) compared five different FREL designs and concluded that the combination of rewarding maintenance of carbon stocks, in conjunction with reducing flows in high-deforestation areas, resulted in higher jurisdictional participation and better cost-effectiveness for global REDD+, generating steeper emission reductions at a lower cost per ton across the entire portfolio of participating countries[54]. Notably, "In the absence of incentives to maintain low emissions rates, countries with historically low deforestation rates underwent an increase in emissions from deforestation due to leakage from other countries. In contrast, the reference level designs that provided REDD incentives to all countries enabled countries with historically low deforestation rates to maintain low emissions rates, and made the REDD mechanism more climate-effective and cost-efficient overall." Furthermore, the study concluded that while there are different potential designs of an HFLD crediting approach, the greatest benefit for limiting forest emissions comes from the inclusion, rather than the exclusion, of HFLD crediting as part of the international portfolio of REDD+ strategies.

Conclusions

Including HFLD credits as part of an overall forest carbon purchasing portfolio is key. At the global level, the purchase of HFLD credits helps avoid leakage of emissions from non-HFLD areas that get credited. In this way, additionality is achieved not only at the level of individual credits, but also *at a portfolio level*, considering the entire portfolio of REDD+ eligible jurisdictions. HFLD crediting is an essential component of an effective global strategy[55,56,57,58] for

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[53] Schweikart, M. et al. (2022). Adaptive approaches to REDD+ are needed for countries with high forest cover and low deforestation rates. *Environmental Research Letters, 17*, 114011. https://doi.org/10.1088/1748-9326/ac9827
[54] Busch, J. et al. (2009). Comparing climate and cost impacts of reference levels for reducing emissions from deforestation. *Environmental Research Letters, 4*, 044006. https://doi.org/10.1088/1748-9326/4/4/044006
[55] One framework to address deforestation pressure globally is the "stock-flow" approach. Stock-flow considers how to reduce absolute forest emissions below global historical levels. It mitigates risk between the "flow" of emissions and the "stock" of standing carbon. This helps assure that global deforestation decreases overall. The stock-flow approach balances rewards for reductions in historical emissions with incentives for maintaining carbon stocks, leading to a more equitable distribution of funding across forested areas facing deforestation pressures.
[56] Cattaneo, A. (2009). A Revised Stock-Flow Mechanism to Distribute REDD Incentive Payments Across Countries. The Woods Hole Research Center. http://www.woodwellclimate.org/wp-content/uploads/2015/09/Stock-flow-mechanism_post-Poznan5.pdf
[57] Cattaneo, A. (2010). Incentives to reduce emissions from deforestation: a stock-flow approach with target reductions. In: Bosetti, V., Lubowski, R. (Eds.), Deforestation and Climate Change: Reducing Carbon Emissions from Deforestation and Forest Degradation. Elgar Publications.
[58] Cattaneo, A. et al. (2010). On international equity in reducing emissions from deforestation. *Environmental Science & Policy, 13*(8), 742-753. https://doi.org/10.1016/j.envsci.2010.08.009

REDD+ as it is envisioned in international climate agreements. Without this component, HFLD jurisdictions will continue to experience increasing pressures on their forests, driven by other sectoral activities (such as biomass energy production[59]) and leakage from other regions. **Together, the crediting of both HFLD and non-HFLD jurisdictions makes large-scale deforestation reductions not only possible but durable.**

[59] Funk, J. et. al. (2022). Assessing the potential for unaccounted emissions from bioenergy and the implications for forests: The United States and global. *GCB Bioenergy, 14*(3), 322-345. https://doi.org/10.1111/gcbb.12912