EDF NATURAL CLIMATE SOLUTIONS CREDITING BRIEFING SERIES #01

Advancing effective and equitable crediting for Natural Climate Solutions

An Introduction

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EDF NCS Crediting Briefing Series

The Natural Climate Solutions (NCS) Crediting Briefing Series will cover key issues involved in using NCS crediting as a climate change mitigation tool. The series of briefing notes will tackle issues, considerations, and trade-offs related to generating, trading, and using NCS credits and will ultimately provide the content for a Handbook on NCS crediting. Topics in the series will include achieving large-scale high-integrity crediting; ensuring financial and environmental equity as credits are created, traded, and used; facilitating and governing trades; and financing the mitigation activities that underly the credits.

Sharing Our Discussion Papers

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1. A Handbook on crediting Natural Climate Solutions

Climate change is already impacting an estimated 85% of the world's population (Callaghan et al., 2021), and radically disrupting global health, development, and welfare (IPCC, 2022). To avoid the most severe potential climate scenarios, the global community must accelerate the deployment of ambitious emissions reductions activities and policies to reduce gross emissions at source and remove existing atmospheric carbon — thereby reducing net emissions and global greenhouse gas (GHG) concentrations.

The earth's natural systems represent a major source of both potential future GHG emissions and potential carbon sequestration — one that the global community cannot afford to ignore. Management actions for both terrestrial and marine systems are needed to prevent the release of these carbon stocks, and to expand and enrich them at scale. These actions represent a powerful set of tools to mediate the pathway toward long-term climate stabilization; they also provide an opportunity to protect and leverage the wealth of other benefits and essential services that ecosystems provide to people and planet, as the global community moves to prevent catastrophic levels of planetary warming.

The term **Natural Climate Solutions (NCS)** refers to actions that increase carbon storage and/or avoid greenhouse gas emissions across global forests, agricultural lands, and marine ecosystems (Griscom et al., 2017). NCS crediting, which can mobilize resources and strengthen incentives to implement and expand NCS, have a role to play as **one** important tool among many needed to achieve climate change mitigation goals. As countries and companies turn climate commitments into action, markets for high-quality carbon credits derived from cost-effective NCS activities can play an important role in meeting mitigation goals — reducing global net emissions rapidly in the near term and encouraging a cycle of even more ambitious global action in the long term. But while enormous interest has materialized from both potential suppliers and potential buyers of NCS credits, clear models of success at the needed scales are lacking. Many observers are — for valid reasons — skeptical about the integrity and effectiveness of NCS crediting. The complexity of underlying technical questions, including a lack of agreement on the definition of *high-quality,* further complicate attempts to map and address issues in the NCS crediting space.

The growing community of NCS practitioners and stakeholders would benefit from consensus on conflicting guidance, consolidation of answers to ongoing technical questions, improved methodologies to further strengthen future credit integrity, and more visible proof points in the

evolving NCS marketplace. These elements can help ensure that NCS crediting continues to develop into a real, scalable, low-risk tool that will protect ecosystems, reduce emissions, and support social and economic benefits for key local stakeholders, including Indigenous People and local communities. **This briefing note** introduces some of the main considerations necessary to ensure the integrity, efficacy and equity of NCS crediting systems; these considerations will be explored further in subsequent briefing notes, and ultimately will be synthesized into a coherent framework in the NCS Crediting Handbook.

This brief begins by discussing the objectives and intended audiences of the NCS crediting briefing note series and the Handbook. It then explains NCS crediting fundamentals while acknowledging and framing central misconceptions and complexities within the NCS crediting space to illustrate the value and timeliness of the Handbook. The brief then illustrates the unique near-term role that NCS and NCS-derived emissions credits can play in achieving a 1.5- or 2-degree pathway, followed by a discussion of NCS markets as part of a package of effective climate mitigation policies and actions. The brief concludes by situating this series and the forthcoming Handbook within the context of unifying and amplifying the many valuable resources in this space.

1.1 Objectives of the NCS Crediting Handbook and briefing note series

The broader NCS Crediting Handbook's **main objective** is to guide readers through the key decisions and complex issues involved in creating effective NCS crediting systems. There is no universal answer to how NCS crediting is done best, and the current set of diverse approaches is evolving. System designers and participants need to draw on the best available knowledge, while tailoring choices to their specific institutional and local context.

While the concept of crediting NCS is not new, advancing the integrity of these credits in practice has proven to be difficult due to confusion about many complex issues and negative experiences. Like all high-integrity carbon credits, high-integrity NCS credits must represent at least one metric ton of real, permanent, additional, quantifiable and verifiable reductions in otherwise unclaimed GHG reductions or removals (Broekhoff et al., 2019). NCS crediting activities must meet all these criteria in a manner that ensures an equitable distribution of benefits and appropriate identification of responsibilities, does not contribute to social or environmental harm, and pays particular regard to those groups who have historically been excluded from relevant decision-making processes.

To help achieve these aims in practice, NCS stakeholders must resolve a set of interlinked underlying issues. Both successful and unsuccessful recent project and program outcomes have provided critical lessons in this rapidly growing and evolving space. A clear framework of key considerations for NCS crediting, including lessons learned from real-world examples, can accelerate much-needed diffusion of knowledge among practitioners, to reduce both confusion and mistrust within and beyond the sector.

This briefing note series and the NCS Crediting Handbook aim to provide accessible guidance on these complex issues, building on existing work by EDF and many others. *The series aims to*:

I. **Reduce confusion** by providing clear explanations of the many interacting aspects of an effective and high-integrity carbon crediting system that can be tailored to different contexts;
II. **Provide technical solutions** to controversial aspects of existing crediting schemes; and
III. **Help focus informed debate** on issues that are unavoidably political, lacking one clear answer but impacting groups differently, or on heavily complex issues that can only be resolved with subjective judgements.

The NCS Crediting Handbook, like the Handbook on design of emissions trading systems (ETS) published by the World Bank and ICAP (2016), will be aimed at a technical audience and can be used as an introductory textbook or reference manual for stakeholders including, but not limited to:

- Technical professionals in government or the private sector aiming to design high-quality crediting programs and the consultants and NGOs that support them;
- Indigenous people and local communities who want to be informed about potential risks and benefits of NCS crediting on their lands, empowering them to play a more active role in developing/co-developing NCS credits aligned with their overall ecological, socio-cultural, management and economic goals;
- Public or private sector buyers seeking to understand what types of credits will best meet their requirements and how to purchase and use them;
- NGOs evaluating their position on issues related to NCS credits;
- Governments considering how to include NCS credits in new or existing policy frameworks (e.g., ETS); and
- Academic researchers and university students.

1.2 Topics covered in the NCS Crediting Handbook and briefing note series

The NCS Crediting Handbook and briefing note series will lay out thoughtful approaches for creating effective, equitable, high-integrity NCS crediting programs and will highlight common pitfalls related to implementation of, and participation in, these systems. The briefing notes focus on key challenges in achieving four goals which will provide information for the subsequent Handbook:

I. Environmental integrity;
II. Equity as credits are created, traded and used;
III. Effective credit commercialization, market development, facilitation and governance of trades; and
IV. Efficient, large-scale finance flows and mitigation investment.

The Handbook will highlight examples and lessons learned from crediting the avoided loss of tropical forests, which is the most studied and well-established NCS crediting activity, to illustrate general arguments and concepts that apply, with appropriate nuance, to NCS crediting across all biological pathways. It will lay a foundation for potentially extending crediting programs to include all biological pathways of forests (tropical, temperate and boreal); agriculture (cropland, grasslands, shrublands and agroforestry); and blue carbon (peatlands, seagrass, salt marsh, mangroves, and coastal and open ocean carbon sinks), to the extent that the science will support adequate monitoring of these systems.

The briefing note series will explore fundamental questions related to issuing credits and their integrity, including in-depth reviews of scale (project vs. jurisdictional[1]), additionality, leakage, and duration/permanence. An emphasis on equity and social safeguards when designing crediting systems will also be discussed in detail, including issues faced both by suppliers and buyers and the equitable sharing of benefits and risks.

These briefs will cover potential models of contract design between suppliers and buyers to manage risks including delivery risk, reversals, and financial risks; financial strategies particularly relevant for specific NCS, including sources and timing of finance; and will identify different investor groups needed to create appropriate NCS capital flows. They will also address

[1] Jurisdictional scale evaluates performance at the level of entire countries or subnational political or supervisory units. See working paper: "Acquiring High Quality Tropical Forest Carbon Credits: Guidance for Corporate Buyers," The Coordinating Committee of Indigenous Organizations of the Amazon Basin (COICA), Conservation International, Environmental Defense Fund (EDF), The Amazon Environmental Research Institute (IPAM), The Nature Conservancy (TNC), Wildlife Conservation Society (WCS), World Resources Institute (WRI), World Wildlife Fund (WWF), May 2022.

integration among NCS market types, which can enhance climate ambition at both international and domestic scales but can also lead to double counting and loss of ambition if appropriate safeguards are not in place.

1.3 Existing resources on NCS and crediting

Driven by rapidly growing interest in the NCS space, many organizations have released **handbooks on various aspects of NCS** including:

I. The Nature Conservancy's Natural Climate Solutions Handbook serves as a guide for countries to quantify the climate change mitigation potential of nature within their borders, using case studies.

II. The European Commission's handbook on Evaluating the impact of nature-based solutions is aimed specifically at practitioners and experts, and provides a NCS impact assessment framework.

III. A 2019 handbook written in collaboration by various organizations, including The Nature Conservancy, WCS, Conservation International, Climate Advisors, National Wildlife Federation and EDF, serves as a resource for countries using NCS to achieve climate goals, and how to include these activities in their NDCs.

IV. WWF's demand-side blueprint describes where investments in nature and climate fit into a corporate climate action strategy, while the supply-side blueprint focuses on high-quality interventions.

V. WWF's Powering Nature report is a guide on how to create the enabling conditions for nature-based solutions.

VI. Tropical Forest Alliance, WWF and Proforest's Landscape Scale Action for Forests, People, and Sustainable Production: A Practical Guide for Companies guides companies on engagement in landscape and jurisdictional initiatives.

Materials on issues relating **specifically to crediting** include:

I. The World Bank's Guide to Developing Domestic Carbon Crediting Mechanisms which focuses on crediting single-project activities and programs of activities; it is aimed at policymakers who want to use carbon crediting to achieve their jurisdictional climate policy objectives but does not specifically touch on NCS.

II. The World Bank's Approaches to REDD+ Nesting is intended to provide guidance for the design and implementation of nested systems.

III. Researchers at Oeko, WWF and EDF have developed a comprehensive methodology to score the quality of project-based carbon credit methodologies, including for NCS activities, to help buyers and observers identify higher integrity credits.

IV. A collaboration between the Stockholm Environmental Institute and GHG Management Institute on the Guide to Using Carbon Offsets covers the characteristics of a high-quality carbon offset and how to avoid buying low quality credits. It also elucidates some of the common criticisms around carbon offsets in general (such as greenwashing) but not specific to NCS.

V. The Voluntary Carbon Market Integrity Initiative's report on Aligning Voluntary Carbon Markets with the 1.5˚C Paris Agreement Ambition: A Global Consultation Report of VCMI and its forthcoming guidance on claims.

VI. An anticipated list of Core Carbon Principles and Assessment Framework developed by the Integrity Council for the Voluntary Carbon Market.

While these materials are valuable resources for their intended audiences, individually they do not capture the full landscape of NCS crediting — they do not comprehensively address how to navigate the previously noted complexities of creating and operating, or participating in, high-integrity NCS crediting markets, how to identify the best approaches for a specific locality or situation, nor how NCS and carbon markets may interact.

The planned NCS Crediting Handbook aims to address these broader sectoral needs and will be correspondingly broader in scope. This new guide will map out the key conceptual and practical challenges of NCS crediting along with the potential solutions to each. It is **not intended to replace** the existing resources, but rather provide a high-level framework and overview of NCS crediting, while empowering the reader to navigate as needed to more targeted and detailed sources like those listed above.

2. What is NCS crediting?

Because global warming depends on the total concentration of GHGs in the atmosphere, all GHG emissions impact the global climate system, no matter where they are produced. This basic equivalency (or fungibility) of GHG emissions makes greenhouse emissions trading and crediting systems possible.

An emissions **credit** represents a quantifiable reduction of emissions (i.e., one credit = 1 metric ton of **CO_2 equivalent or CO_2e**) relative to a baseline. Credits can be **generated** by activities that result in either:

I. **Emissions reductions:** avoidance of new GHG releases into the climate system, relative to what otherwise likely would have been emitted; or

II. **Emissions removals:** capture of previously emitted carbon or equivalent gases from the climate system, coupled with long-term storage through natural or technological means (sequestration) above what otherwise would likely be captured and stored.

Crediting NCS activities is one way to incentivize NCS-based emissions reductions (including those that might otherwise be infeasible or inequitable to mandate) by harnessing market forces. People who can make changes to their behavior or operations to quantifiably reduce emissions, or who can perform activities that store or sequester carbon, may become credit **suppliers** and receive payments and/or financing for taking these actions. **Buyers** of credits, in turn, may claim the reductions or removals that a purchased credit represents as part of their own emissions accounting (for the purposes of **offsetting** their own emissions). Buyers may include countries, companies or other actors attempting to meet regulatory requirements or voluntary commitments to reduce the GHG emissions they are responsible for, but who find it costly or otherwise challenging to meet these goals at the needed speed. Buyers may also be actors who have limited control over emissions for which they are indirectly responsible, but still need or want to compensate for their full impact on the climate system. Not all purchased NCS credits are used as offsets: Some actors, including philanthropists, companies, governments or multilateral agencies, may simply wish to support more NCS activities, and may exercise the option to pay for credits but never use them for offsetting. The opportunity to purchase NCS-based credits empowers these actors to target their support of activities that reduce or remove emissions in the near term.

Purchasing credits **does not eliminate the need for credit buyers to quickly decarbonize.**[2] It can, however, help drive progress toward net emissions reductions, while easing the economic and social pathways toward structural changes needed for deeper decarbonization. A well-designed regulatory or voluntary commitment system that drives demand for credits simply provides a financial incentive for early decarbonization and can be coupled with a rising penalty for continued emissions in compliance markets; in other pollution reduction contexts (e.g., see Ellerman, Joskow and Harris, 2003; Liang and Mehling 2013), this

[2] There are efforts underway to promote appropriate mitigation hierarchies to ensure that credits are supplemental to internal efforts to decarbonize, rather than a replacement for such efforts. For example, the Science Based Targets initiative (SBTi) requires companies seeking target recognition to set targets based on emission reductions through direct action within their own operations and/or their value chains. Credits are only considered to be an option for companies wanting to finance additional emission reductions beyond their science-based targets.

paired “carrot-and-stick” trading approach has driven rapid emissions reductions at relatively low cost.

2.1 Basic Elements of NCS Crediting Markets

In a comprehensive, economy-wide system for emissions trading, buyers and sellers of NCS credits transact through **markets** (see Figure 1). Ideally, these markets would not only include NCS credits, but also greenhouse gas allowances for other sectors (either auctioned or freely allocated by governments) and credits generated from non-NCS activities. Market transactions may be administered, monitored, and otherwise supported by a variety of intermediary and independent third-party entities involved in crediting design and implementation.

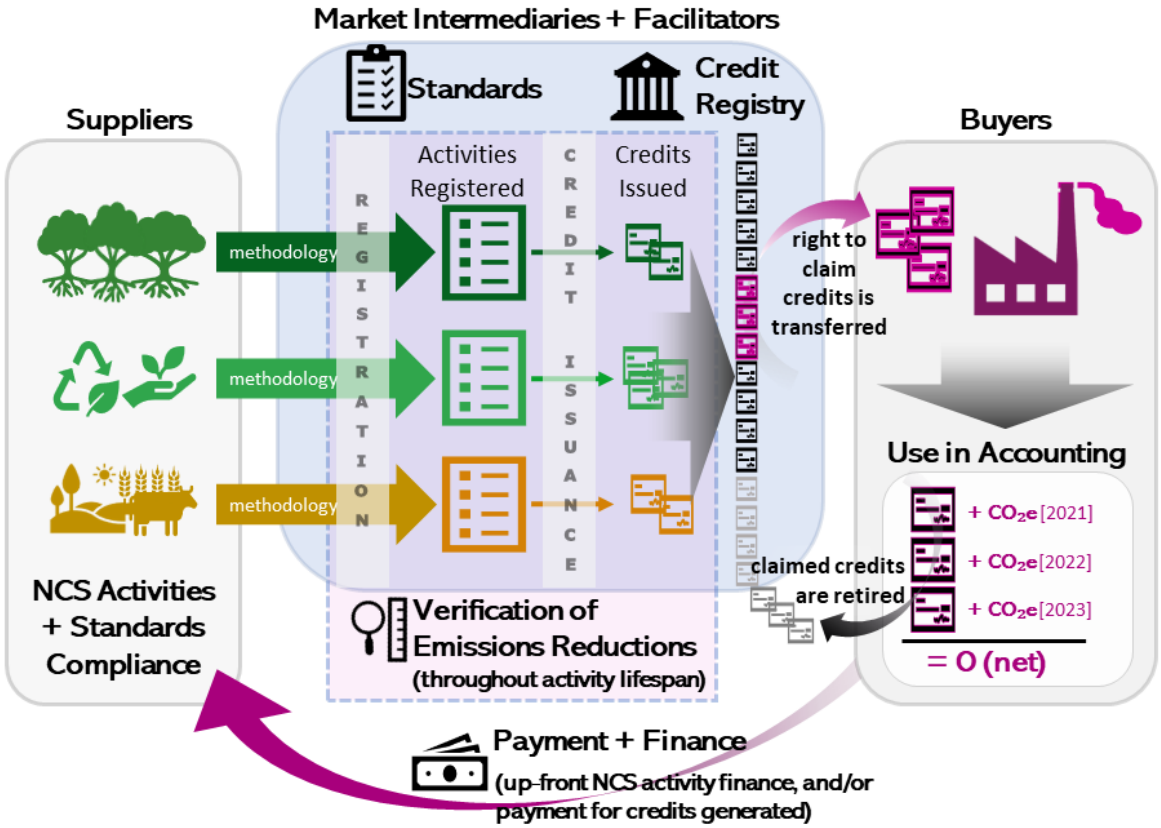

Figure 1: Illustration of relationships among NCS credit suppliers, buyers, and major elements within a typical NCS credit market

Producers of NCS credits — whether at the level of the individuals, communities and jurisdictions directly working to protect, restore or enhance ecosystems, or at the level of managing intermediaries coordinating NCS activities to facilitate credit generation — can choose to align their NCS activities with one or more crediting **standards.** These standards are typically published either by the jurisdictions that allow credits to be used to meet legal

obligations, or by third-party organizations interested in credit integrity or market facilitation. However, these standards vary widely on key elements of credit design and integrity, and a single agreed-upon international framework to guide best practices has not yet been adopted.

Standards govern eligibility and conditions for participation in a given crediting program and the specific methodologies to translate emissions-reducing activity into credits. Different types of NCS activities are subject to individual **methodologies** or **protocols** to determine the emissions impact assessed from a particular project or activity. For example, the number of credits generated by primary forest conservation would be determined through a different methodology than credits generated by agroforestry or wetland restoration.

An NCS activity under development can be **listed** (also known as "registered") within a credit trading program, formalizing a relationship with the program under the appropriate methodologies and other applicable rules. The activity and emissions reductions it generates must be **verified** by an independent validation and verification body, which confirms the application of proper methodology to estimate GHG emissions reductions and conformance with relevant safeguards to ensure activities are truly occurring as claimed. The credits corresponding to verified emissions are in turn **issued** by the standard-setting organization and documented within a **credit registry.** New credits may accrue over the duration of the registered activity's lifespan as additional emission benefits are verified.

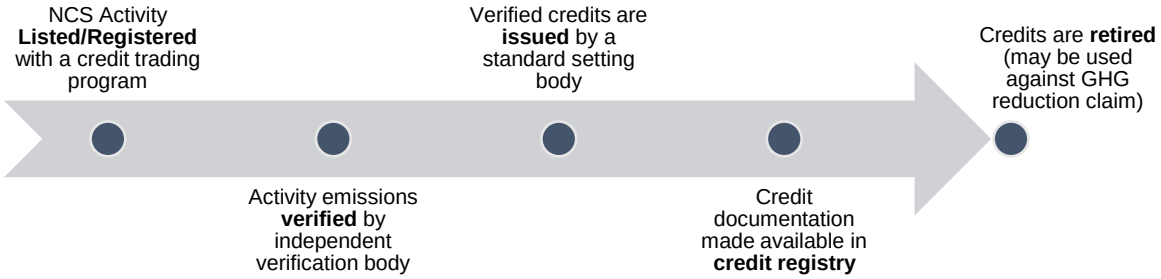

Figure 2: Overview of the carbon credit lifecycle

Credits in a standard-setting organization's registry may be purchased and added to the quantity of mitigation allowances used by a buyer to demonstrate that a GHG target or compliance obligation has been met. Once a credit is used in this way, it is **retired** within the registry and cannot be used again. Some projects are financed directly by investors intending to purchase and/or use the credits from the financed project, while other buyers may be matched to credit

generators by an intermediary broker. The specifics of market participation, eligibility and structure may vary by market type and among individual markets.

2.2 Understanding NCS crediting as part of global climate mitigation

The reduction of emissions from natural systems has an essential place in the transition to a greener global economy — given both the potential to use NCS to cost-effectively reduce global emissions in the near term and the scale of additional climate damage possible if the international community does *not* protect these critical resources. Just one natural ecosystem type, the world's forests, stores approximately 791 gigatons (Gt) of carbon (Goldstein et al., 2020). Every year, forests *absorb* around 26% of global GHG emissions, actively removing CO_2 from the atmosphere; at the same time, due to deforestation and other disturbances, they also *release* 14% of global annual GHG emissions (Harris et al., 2021). While Indigenous Peoples and local communities managing forested landscapes are increasingly recognized as critical and effective stewards of the ecosystems within their territories (e.g., Frechette, Ginsburg, & Walker, 2018), the emissions resulting from the cumulative total of all human activities in forests contribute as much to climate change annually as all the cars and trucks in the world combined (IPCC, 2014). Deforestation both releases GHGs and prevents the lost forest area from sequestering additional carbon. Thus, any realistic plan to reach global emissions commitments in line with a 1.5- or 2-degree warming limit must account for, and protect, these vital ecosystems (Goldstein et al., 2020). Continued destruction of carbon rich ecosystems could push current climate mitigation goals out of reach.

NCS have the potential to be cost-effective tools for significant mitigation of both carbon and other GHGs. The Nature and Net Zero report (2021) estimated that NCS can provide one third of the climate mitigation needed to reach a 1.5-degree pathway, at a much lower cost than other existing CO_2 removal technologies.[3] NCS can also help mitigate short-lived climate pollutants (SLCPs) which persist for less time in the atmosphere than CO_2 but cause proportionally more warming per unit of emissions. For example, improved management of peatlands and wetlands can reduce potent short-lived gases like methane — the second most abundant anthropogenic GHG after CO_2, with a global warming potential 84-86 times greater than CO_2 over 20 years and 28-34 times greater over 100 years (UNECE n.d.).

[3] The Nature and Net Zero report NCS estimates the total "practical" abatement potential from NCS as 6.7 Gigatons CO2 per year by 2030. They further estimate that 23 Gt CO_2 of emissions need to be abated by 2030 for the world to remain on a 1.5- or 2-degree pathway.

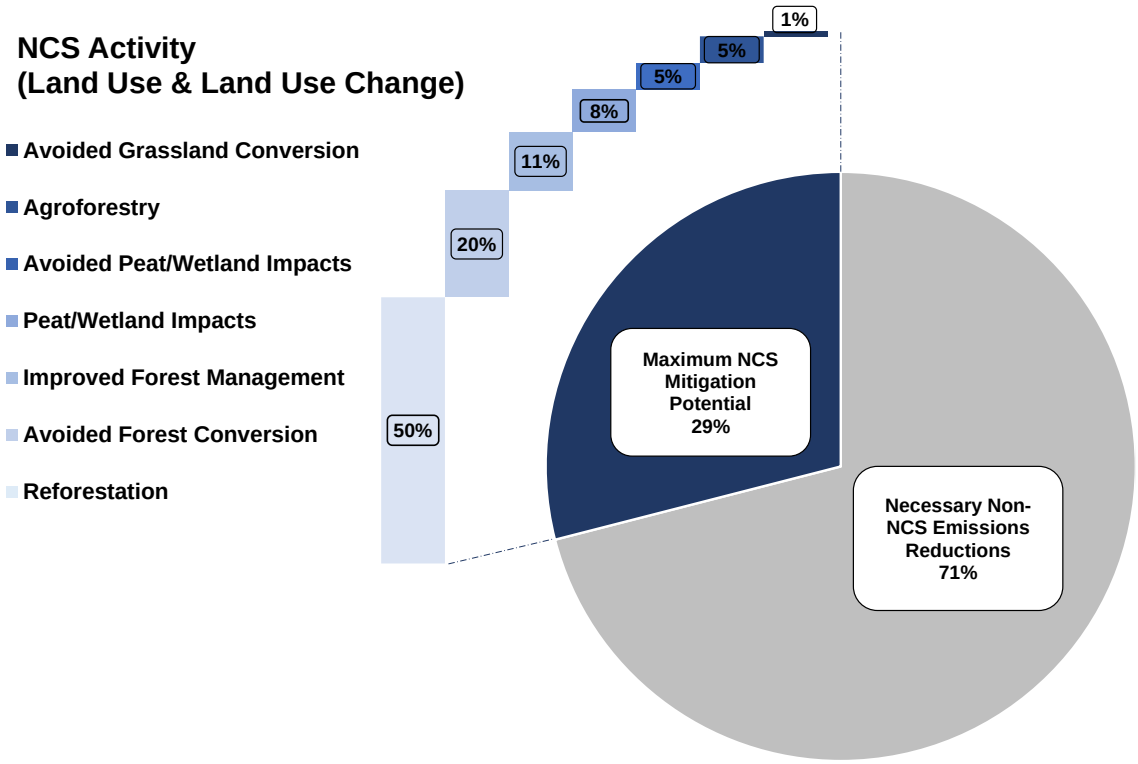

Figure 3: Maximum NCS abatement potential for land use and land use change by activity compared to total emissions reductions required at a 2030 reference year for a 2-degree pathway[4]

In addition to providing climate mitigation by reducing GHG emissions, NCS activities can provide a range of environmental, social and economic **co-benefits** (Brand, 2021). Activities that conserve and restore natural systems may simultaneously protect or restore other ecosystem services provided by these systems, such as water quality improvement and protection of biodiversity (IPCC WG III, 2014). Well-designed NCS implementation can also provide direct and indirect social benefits, stemming in part from these ecosystem service improvements and from avoidance of greater climate-related impacts. These benefits include improved food and water security (Cohen et al., 2016), improvements to human and ecosystem health, and the building of systemic resilience (Lancet Countdown, 2021).

Time-limited mitigation opportunities and avoiding irreversible loss

Natural Climate Solutions, when combined with other in-sector decarbonization activities, offer a cost-effective path toward emissions reductions through the regeneration and avoided loss of

[4] Adapted using maximum abatement potential for each NCS biological pathway relating to land-based mitigation (marine not included) from Griscom et al., 2017. We excluded grazing, improved agriculture and improved rice cultivation. The total necessary emissions reductions needed for a 2-degree pathway (23 Gt CO_2) comes from the Nature and Net Zero report.

major stocks of carbon stored in ecosystem biomass. Crucially, however, the success of GHG mitigation through NCS strategies depends on acting before climate and land-use changes progress beyond key thresholds, locally and globally. Therefore, time is of the essence and action needs to be taken sooner than later.

The earth's ecosystems store an enormous amount of carbon and organic matter that can be released into the atmosphere as greenhouse gas emissions if these systems are degraded or destroyed. Significant deforestation, or other human-driven ecosystem damage, may trigger additional environmental stresses linked to degradation (such as shifts in local patterns of rainfall or fire in forest systems, or changes in nutrient cycling in aquatic settings) (Lawrence et al., 2022). In these systems, threshold levels of ecosystem degradation may have the potential to set off transformational **feedback loops**, leading to more severe and far-reaching ecological damage than might otherwise be expected. For example, deforestation in the Amazon Basin, coupled with synergistic changes linked to loss of tree cover, may have cascading regional and global consequences (see **Box 1**). In such **tipping point** scenarios, the resulting damage to interlinked climatic and biological cycles may also shift local conditions to new stable states (Scheffer et al., 2001), making attempts to restore lost ecosystems even more challenging.

Box 1. Tipping Point: Amazon Forest dieback

A changing climate may push the southeastern Amazon Basin into a potentially irreversible feedback loop — a stark example of a looming climatic tipping point.

Global climate change causes hotter and drier conditions in the Amazon, weakening the area's geophysical suitability to sustain a rainforest. As the rainforest is cut down, burned and logged, the hydrological cycle in Amazonia is impacted. Local forest loss leads to less cloud formation through transpiration from rainforest trees themselves. As forest loss approaches 25%, changes in precipitation patterns may trigger further negative feedback loops of forest dieback and longer dry seasons, amplifying the stresses of global change on these ecosystems (Lovejoy & Nobre, 2018). This dieback also results in large volumes of emissions through the loss of carbon stocks in trees and soil, further strengthening warming.

This tipping point threshold may be dangerously close, as about 20% of the Brazilian Amazon Forest has already been lost (Lovejoy & Nobre, 2019). With continued deforestation and resulting decreased rainfall, parts of the Amazon are expected to permanently shift to a grassland system within 10-15 years (Amigo, 2020); these regions will no longer climatically support a rainforest. Such conversion would represent a permanent loss of carbon storage ability. Crossing the tipping point in this system would have cascading effects on the entire South American continent. It would also affect the global climate system, possibly putting a 2-degree warming target out of reach due to diminished potential carbon storage (Boulton, Lenton & Boers, 2022).

The recent IPCC report (2022) found that some rainforest ecosystems are already reaching their limits on their ability to adapt to climate change and that "projected climate change, combined with non-climatic drivers, will cause loss and degradation of much of the world's forests (high confidence), coral reefs and low-lying coastal wetlands (very high confidence)." These limits on some forests' abilities to adapt to climate change implies risk for their long-term value as carbon

stores, which emphasizes the immediate need to bolster near-term efforts to protect and regenerate these biological systems—and reduce the ongoing warming that itself plays a role in triggering or exacerbating some of these feedback cycles (e.g., Reid et al., 2016).

This urgency around conservation, as opposed to just restoration, stems also from the fact that **newly restored ecosystems are not functionally equivalent to the mature systems whose losses they are intended to replace**, in terms of the magnitude and timescale of their total carbon storage potential or ability to provide other ecosystem services (Lennox et al., 2018; Cook-Patton, Drever & Griscom et al., 2021). For example, the clearing of an area of mature forest represents the release of carbon stores developed over decades or centuries; even if such an area were immediately replanted after deforestation, young trees cannot sequester carbon fast enough to replace the loss of the original forest carbon stock for many years. The IPCC (2006) notes for most types of forest ecosystems that reforested land may take over a century to build stocks of carbon comparable to what is stored by their undisturbed counterparts (as illustrated in **Figure 4**).

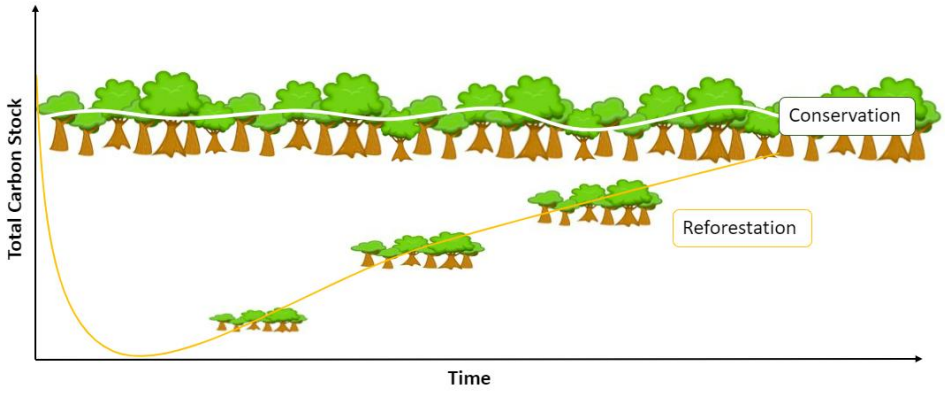

Figure 4: Conceptual illustration of total carbon storage by mature standing forests under conservation, compared to storage under deforestation and reforestation of a similar acreage

Global climate mitigation requires rapid action to avoid potentially catastrophic warming pathways. Wide-scale restoration of lost ecosystem carbon stocks takes time. On a global scale, the protection of carbon stocks in existing mature ecosystems is likely far more feasible and cost-effective than attempts to replace that same enormous quantity of stored carbon through future replanting, or to mitigate their emission by other means. This reality is one reason why mature forests are critical to protect and appropriately value within crediting systems.

Recognizing the importance of taking immediate action to protect intact forests, more than 100 global leaders (representing nations that account for 85% of global forests) pledged at COP26 to

halt and reverse deforestation and land degradation by 2030 (Glasgow Declaration, 2021). But as of 2020, carbon-rich landscapes were being cleared and destroyed at a rapid pace globally, including approximately 10 million hectares of deforestation per year (FAO and UNEP, 2020).

The prevention of deforestation and ecosystem destruction through NCS activities lessens the future need to rely on expensive, unproven at scale and perhaps ineffective efforts to mitigate for today's ecological losses. To avoid future pain, and to take full advantage of the co-benefits of NCS strategies like wetland conservation, these strategies must be prioritized now, *before* these losses occur. Halting emissions from forests and peatlands conversion in the next decade, and removing further emissions through natural systems over the next several decades, can help keep the world on track to meet 1.5- or 2-degree climate goals (IPCC 2021). NCS crediting, if done thoughtfully and effectively, can help catalyze these urgently needed actions.

2.3 Challenges with NCS crediting

Past negative experiences, and a lack of clarity and consensus on how to create high integrity NCS credits and how to transact them, have cast doubt on the use of credits as a climate mitigation tool. Concerns related to crediting include environmental integrity, standardization, and equity. These concerns apply to crediting across all sectors and are not unique to NCS. The use of carbon credits may be a cost-effective and beneficial tool for getting the world on a 1.5- or 2-degree pathway and securing sufficient finance for NCS. However, skeptics are concerned about their environmental integrity and believe carbon crediting may disincentivize corporations or sovereign governments from implementing meaningful emissions reductions in their own supply chains or within their own borders (Pearse & Bohm, 2014; Greenpeace International 2021). These concerns can be addressed through both conventional and innovative approaches to preserve integrity, and this briefing note series, and subsequent Handbook, aims to show how.

The environmental integrity of NCS credits — that is, whether they actually reflect the tons of GHG emissions they claim to reduce or store — is a primary concern. Similar challenges are also faced by non-NCS credits. A think tank working on carbon markets asserted that "there is an inherent high risk that forests do not represent real emission reductions due to the impermanence of forest carbon, inflated baselines, problematic additionality testing and difficult monitoring reporting and verification" (Green Finance Observatory, 2020). A 2020 study on crediting schemes in the Brazilian Amazon found that many projects overstated their emissions values, citing a range of project- and locale-specific issues with execution and finances, as well as flagging the infrequency of updates to local deforestation baselines as a

broader problem in assuring the true additionality of NCS activities (West et al., 2020).The U.S. Government Accountability Office stated in a 2008 assessment of the Clean Development Mechanism, a UN-driven carbon offsetting scheme, that "it is impossible to know with certainty whether any given project is additional." Some crediting mechanisms are still being evaluated for their scientific integrity related to NCS systems and the biological pathways within them. Smith et al., (2019) assert that "since soil organic carbon (SOC) cannot be easily measured, a key barrier to implementing programs to increase SOC at large scale, is the need for credible and reliable measurement/monitoring, reporting and verification platforms, both for national reporting and for emissions trading. Without such platforms, investments could be considered risky." Similar challenges in monitoring, reporting and verification also exist for blue carbon, and the science to improve understanding of blue carbon NCS is less robust than other NCS activities (Howard et al., 2017). These concerns, among others, and potential solutions will be addressed in this briefing note series and the subsequent NCS Crediting Handbook.

Another challenge in the NCS space and in other sectors stems from the absence of cohesive leadership on standardization, quality control and governance of credit methodologies, or implementation practices. Without overarching leadership in this space, both buyers and sellers may experience confusion when looking to produce and transact as they navigate choices among different standards or credits whose relative levels of quality may be difficult to meaningfully discern. This lack of standardization can also allow non-serious actors in this space to trade low quality credits thereby reducing the overall trust in NCS credits. One study (West et al., 2020) explicitly argued that well-designed and successfully executed REDD+ projects (a subset of NCS activities[5]) can indeed provide emissions benefits as intended, but lead author Thales West expressed in an interview that many existing methodologies and implementation practices "are not robust enough," and that under the existing diversity of practices "there is room for projects to generate credits that have no impact on the climate whatsoever" (Greenfield, 2021).

Critically, local communities have frequently been left out of NCS crediting decision making and implementation, historically leading to negative impacts on communities and their livelihoods. Cándido Mezúa, the representative of the Emberá people, asserted that little has been done to define and ensure compensation for Indigenous communities for their NCS activities (Godoy, 2016). Agnès Callamard, Secretary General of Amnesty International, has stated that "many offsetting and carbon removal projects – used to meet net zero targets – result in human rights

[5] REDD+ is the shorthand acronym for the UNFCCC framework on "**R**educing **E**missions from **D**eforestation and forest **D**egradation, [**plus**] the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries." REDD+. UNFCCC. https://unfccc.int/topics/land-use/workstreams/reddplus

violations of Indigenous Peoples and local communities, especially in the global South" (Greenpeace International, 2021). Carbon Market Watch's assessment (2018) of an afforestation project in the Kachung Central Forest Reserve highlighted that the project excluded local communities from accessing land previously relied upon for "vital livelihood activities," in areas already facing food insecurity, hunger and poverty. However, these shortcomings are not inherent problems with crediting but rather a failure of certain projects. For example, Jurisdictional programs can provide effective rights protections and have produced on-the-ground benefits for Indigenous and local communities. "From the beginning of the discussion of the Tropical Forest Standard [California's standard for crediting emissions reduction from deforestation], we have been insisting that it should have a strong content on the rights of indigenous communities and other traditional forest communities," stated Levi Sucre Romero, coordinator for the Mesoamerican Alliance of Peoples and Forests. "In the proposed standard under discussion, these rights are clearly respected through consultation requirements and free, prior, and informed consent" (CARB, 2019). The German Ministry for Economic Cooperation and Development (BMZ) "REDD Early Movers Program" in the Mato Grosso and Acre states in Brazil has engaged Indigenous communities and organizations in project design and provided concrete benefits to local communities (Schwartzman, 2021).

Policymakers should respond to the shortcomings and concerns revealed by past projects by instituting necessary guardrails and robust methodologies, founded on inclusive processes. This includes effective and equitable participation of Indigenous Peoples and local communities from the outset and that adequately account for issues of procedural justice and equity, aimed at ensuring the efficacy of NCS crediting programs and the social integrity of those credits. Multiple programs and standards already have strong rules around social safeguards to specifically address the issue of equity and benefit sharing.

3. Harnessing market forces to drive investment in NCS

Markets for high-quality carbon credits derived from cost-effective NCS activities have an important role to play in the next decade to meet mitigation goals for companies and countries as their climate commitments are converted into action.

Piris-Cabezas, Lubowski and Leslie (2019) modeled the power of international emissions trading markets to raise global ambition to meet Paris Agreement pledges (NDCs), looking at the cost of achieving these goals with global markets compared to a base case in which countries

achieve NDCs without cooperation. They found that by including trade of forest credits in these markets, the world could **nearly double global emissions reductions achieved through trading, at no additional cost** over 2020-2035.[6] This demonstrates the enormous scale at which forest protection, and international markets for NCS-based emissions reductions, could help bring the world's climate mitigation goals within closer reach.

For jurisdictions, communities and landowners who do not have their own strong emissions reduction commitments, the opportunity to sell NCS credits can financially enable and encourage actors to conserve, restore and sustainably manage natural systems in the face of external pressures. For example, paying land stewards to manage land in a way that will increase carbon storage in forests, rather than to clear the same land for development, can level the economic playing field in places where carbon intensive economic activities directly compete with environmental protection and restoration.

Strengthening markets and global demand for high-quality NCS-based carbon credits can also motivate beneficial and sustainable land-management practices in contexts where regulation is less attractive. In some locales, imposing mandates for NCS activities might be inequitable, infeasible or impractical; in some of these situations, well-designed NCS crediting opportunities may provide important motivation for NCS activities. For example, blunt legal requirements to perform conservation and other NCS activities might impose an unfair burden on small landholders who might instead be drawn toward the same land use changes by economic incentives (e.g., Jones et al., 2017). On the other hand, political opposition to conservation from powerful entities and constituencies in control of large areas of land could effectively delay or prevent the enactment of such mandates in many jurisdictions; these landed elites, known in many parts of the world to hold outsized political power (e.g., Fernandez Milmanda, 2019), might be incentivized economically to conduct the same NCS activities through a crediting system. Providing payment for NCS activities through a high-integrity credit market can help incentivize NCS-based emission reductions and removals that could be challenging or impossible to capture by mandate, while motivating buy-in from stakeholders who would otherwise be uninterested.

In the long-term, these local and international markets could enable purchasing countries and companies to finance global emissions reductions achieved through efforts abroad, in addition to complementing aggressive actions within their own jurisdictions to meet ambitious climate targets. NCS credits can provide a flow of finance for economic development and environmental

[6] Compared to 2015 NDC ambition, while holding the cost of compliance constant. This is a doubling of ambition.

conservation, and to develop more productive and sustainable agricultural practices; this can help reduce the pressure for horizontal expansion into precious natural ecosystems while improving living standards. NCS credit programs can also generate employment where these activities are based, contributing to local financial sustainability. Additionally, NCS crediting can provide new revenue streams to historically marginalized communities, economically disadvantaged regions, and developing countries to enable low carbon development pathways. Thus, NCS crediting can help build a mutually reinforcing cycle of payments for performance and enhanced ambition, at the scale necessary to protect carbon rich ecosystems and support a stable climate in the long run.

3.1 Incentivizing NCS through carbon credit markets and by other means

Credits for NCS activities may be issued and sold through compliance markets created in response to jurisdictional legal obligations, or through markets catering to entities pursuing voluntary climate commitments. The development of non-market finance mechanisms (including payments for ongoing conservation or other sustainable land management practices *not* resulting in a tradeable unit of benefit) can also play valuable complementary roles in establishing long-term financial support for high-integrity NCS activities — whether by supporting NCS activities by land users within a jurisdiction with a results-based agreement, laying foundations for the development of a future credit supply prior to the availability of results-based payments, or through the trial-and-error development of innovative solutions to problems also faced by those developing tradeable credits (such as effective monitoring and verification). Actors working toward meaningful and equitable emissions reductions or removals through any of these means may generate valuable knowledge benefitting the NCS sector as a whole. We therefore discuss all three below.

Compliance markets are created by **"cap-and-trade"** policies (or **emissions trading systems** (**ETS**)); they may also be created in relation to **carbon taxes**. As of 2021, the International Carbon Action Partnership (ICAP) estimates that 16.1% of global emissions are covered within an implemented ETS, with a further 5.5% covered by carbon taxes (ICAP, via World Bank, n.d.). The total value of trade within carbon emissions compliance markets in 2021 was around $850 billion, based on estimates by groups tracking these markets.[7]

[7] The financial data firm Refinitiv estimated the total turnover of carbon markets in 2021 as $851 billion (Nordeng et al. 2022); non-compliance markets surpassed $1 billion for the first time during the same year (Ecosystem Marketplace, 2021).

Companies with obligations under ETS may be allowed to meet some of their emissions targets by purchasing credits generated from activities in other sectors, or even within other ETS systems. Systems may set diverse **quantitative limits** on how much of a company's total emissions can be met through this type of offsetting, though these limits may change over time. For example, the California and Quebec systems allow some use of credits to meet compliance requirements, including each jurisdiction allowing credits valid under the other's system; the EU's trading system currently allows no credits as part of meeting compliance (though it did allow them in earlier program phases), while Kazakhstan's national system does not currently limit the proportion of compliance that may be met through the surrender of credits. (ICAP, 2021). Trading systems may also set **qualitative limits** on the types of activities that can form the basis of allowable credits (which may or may not include NCS activities), and on the geographies in which those activities must occur. For example, several of the local ETS programs piloted in China prior to the recent adoption of a national system incentivized acquiring credits derived from activities within the provinces or ecoregions within or near the jurisdictional territory of the program; California's trading system has recently moved to require that half of all accepted credits have direct environmental benefits to the state, while on the other hand, Korea's national trading system has restructured its incentives to support the use of more non-domestic activity credits, in its later phases (ICAP, 2021). Existing NCS compliance markets include crediting systems for temperate and tropical forests.[8,9]

Few examples yet exist of international compliance markets, but these are worth noting given the potential for future expansion of international cooperation on this front. The EU's trading system includes participation by several non-EU nations; at the province/state market level, California has linked its trading market with that of Quebec. And under the UN's international aviation treaty, a sectoral compliance market has also developed, known as the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA). As global climate mitigation ambitions rise, international compliance markets could one day serve as important global drivers of finance for NCS activities, if they develop to include NCS-based credits.

Voluntary carbon markets (VCMs) enable public and private investors, non-governmental organizations, and corporations to voluntarily purchase carbon credits to compensate for their emissions beyond their current ability to reach climate-related reduction commitments. Demand for credits within these markets is driven by a growing trend of corporate

[8] E.g., California Air Resources Board Compliance Offset Program, New Zealand Emissions Trading Scheme, Forestry in NZ ETS

[9] E.g., Colombia's Programa Nacional de Cupos Transables

commitments to emissions reductions beyond legal requirements, as well as rising consumer interest in climate-neutral products. Voluntary credit purchases can, for example, help mitigate the impacts of emissions embedded in supply chains that cannot yet be eliminated given slow changes to technologies or practices. As of 2021, the UK's Energy and Climate Intelligence Unit estimated that over one-fifth of the 2,000 largest companies globally — representing $14 trillion in sales annually — had made net-zero commitments in some form (Black et al., 2021).

In 2021, VCMs hit an annual market value of $1 billion for the first time (Ecosystem Marketplace, 2021); NCS-derived credits constitute a fast-growing proportion of credits available in these markets. In 2020, the land sector overtook renewable energy as the largest source of voluntary credits by volume, and as of August 2021, the estimated annual volume and value of voluntary credits for forestry and other non-agriculture land reached 115 $MtCO_2e$ and $544 million — more than three times greater than the volume and value in 2019 (Forest Trends, 2021). The Platts CNC price index, which tracks a group of nature-based carbon credits, rose by over a third between September and December to ~$12/MtCO2e (S&P Global Platts, 2021). Existing voluntary NCS markets for forests (tropical and temperate), agroforestry and coastal blue carbon (including mangroves and tidal marshes) are well established, while voluntary markets for boreal forests, croplands, grasslands, and wetlands are still emerging.

Non-market pathways can also fund and support NCS activities, whether through results-based payments or through other means that directly compensate land stewards for protecting ecosystem services and other related sources of benefit. Examples of non-market support for NCS include domestic initiatives based on results- and/or performance-based payments, such as Costa Rica's Payment for Ecosystem Services (PES) scheme which pays landowners to protect forest in return for the benefits they provide (including GHG mitigation, biodiversity protection, water conservation and "natural scenic beauty for tourist and scientific purposes") (FONAFIFO, n.d.). Multilateral programs may also support non-results-based payments for NCS activities likely to provide beneficial climate impacts or other co-benefits. For example, the Green Climate Fund financially supports developing countries to raise and realize their NDCs towards low-emissions and climate-resilient pathways, de-risking investments to mobilize finance at scale and align it with sustainable development (Green Climate Fund).

Although policies and initiatives relying on these other mechanisms of payment may have different goals or near-term outcomes than funding NCS through carbon credit markets, they may face many of the same challenges encountered by those working to design and implement high-integrity NCS credit systems. Lessons learned on either side of the boundary between

market and non-market NCS activities may be applicable and valuable across the entire NCS sector.

Challenges and complexities arising from market considerations such as the choice of trading partners, brokerage arrangements, international institutions support of global credit trading and various credit commercialization options will be discussed in forthcoming briefs in this series, as will the use of markets to enhance climate ambition.

As mentioned throughout, this introduction is the first note in a series of briefing notes which will explore an array of topics related to NCS crediting and seek to address related concerns. These briefing notes will ladder up to a subsequent NCS Crediting Handbook which we aim to release in late 2022. The subsequent briefing notes will be made available/published online at https://edf.org/natural-climate-solutions-and-carbon-crediting.

The opportunities offered by NCS for climate change mitigation are enormous, but successful implementation requires carefully designed mechanisms that provide appropriate incentives for all actors; it also requires an understanding of distributional and procedural equity implications of technical decisions, and the establishment of an enabling institutional environment for high-integrity, large-scale programs. The NCS Crediting Handbook will clearly and concisely guide the reader through the main considerations necessary to achieve these elements; in so doing, this resource will help unlock the potential of NCS crediting to equitably enhance global climate efforts, at the ambitious scale needed to meet the true urgency of the climate challenge.

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