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WORKING PAPER

CONSIDERATION OF NATURE-BASED SOLUTIONS AS OFFSETS IN CORPORATE CLIMATE CHANGE MITIGATION STRATEGIES

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EXECUTIVE SUMMARY

Highlights

- Many companies are beginning to incorporate nature-based solutions (NBS) in their climate mitigation strategies to offset fossil fuel emissions.
- The financing of NBS is an essential and urgently needed component of society's transition to net-zero emissions.
- This paper describes the opportunities and risks associated with using NBS as offsets, focusing on the environmental and social integrity of demand-side purchases and supply-side emissions reductions and removals.
- Companies can take steps now to build confidence in the use of NBS as offsets by implementing ambitious strategies for abating their own fossil fuel emissions as well as signaling demand for high-quality NBS emissions reductions and removals credits.
- As the rules surrounding the use of NBS as offsets continue to be debated in multiple policy arenas and voluntary initiatives, companies can advocate for robust standards and norms to govern voluntary and compliance-based transactions.

CONTENTS

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Background

Nature-based solutions are activities that harness the power of nature to reduce the accumulation of greenhouse gases (GHGs) in the atmosphere and provide benefits for adaptation, biodiversity, and human well-being.[1]

The imperative of reducing forest-related emissions was briefly in the spotlight when the United Nations Framework Convention on Climate Change (UNFCCC) began negotiating a results-based financing mechanism in 2007. However, the failure to generate market-based demand for such reductions resulted in a decade of relative neglect. The topic of NBS reemerged on the international agenda in 2019. In two major reports that year, both the Intergovernmental Panel on Climate Change and the NBS track of the United Nations Climate Action Summit highlighted the consensus of the science and policy communities regarding the urgency of incorporating NBS into climate mitigation strategies.

At the same time, many companies have accelerated the process of formulating and communicating targets and strategies for reducing and removing emissions, including commitments to achieve "net zero" by a certain date. The prospect of offsetting emissions by purchasing NBS emissions reductions and removals credits provides an opportunity for increased finance for nature conservation and restoration. However, it has also rekindled concerns that the availability of offsets will dilute corporate ambition and otherwise threaten the environmental and social integrity of climate action. Answers to questions about the appropriate use of NBS as offsets to meet corporate emissions reduction targets are urgently needed.

About This Working Paper

This paper reviews the prospective roles of NBS as offsets[2] in corporate mitigation strategies and as a source of finance for NBS to combat climate change. It briefly describes the enormous potential benefits of NBS, summarizes the risks associated with the use of offsets, and offers strategies for managing those risks. The paper also identifies issues that are unresolved as well as relevant policy arenas and initiatives in which the standards and norms for using NBS as offsets in voluntary and compliance-based schemes are under discussion. Finally, the paper suggests "no regrets" actions that companies can take now.

NBS as Offsets

NBS are critical to delivering on global climate goals but have not yet received financing commensurate with their mitigation potential. Investments in NBS can generate cobenefits for adaptation, biodiversity, and other sustainable development objectives. Although corporate purchases of NBS credits could provide a much-needed source of financing, the integration of NBS into corporate mitigation strategies—and especially the use of NBS credits as offsets—is controversial. A stronger consensus is needed on what standards and norms are adequate to ensure environmental and social integrity.

Risks and Strategies for Companies to Consider

Two overarching concerns must be addressed as companies consider integrating NBS into their climate mitigation strategies. First is the concern that companies may prioritize the use of offsets over reducing emissions from their own operations, supply chains, or the use of their products, thus resulting in emissions greater than what would have happened without the availability of offsets. A key challenge, therefore, is ensuring "demand-side environmental integrity" where offsets enhance rather than dilute corporate climate action. The second concern relates to the quality of the carbon credits used for offsetting: credits must represent real reductions or removals of GHG emissions from the atmosphere to compensate for fossil fuel emissions. Ensuring this "supply-side environmental integrity" of the use of NBS as offsets requires addressing issues such as additionality (emissions reductions must be additional to what would have happened in a business-as-usual scenario), leakage (emissions are not simply displaced elsewhere), permanence (reversal risks are mitigated), and double counting (credits are used only once towards a climate target); in addition, social safeguards must be applied to ensure that emissions reductions do not harm communities.

Prospective finance from the use of NBS as offsets could incentivize immediate actions that provide near-term reductions of emissions and medium- to long-term removals from the land sector. In parallel, individual companies, industries, and society at large could advance on commercializing and bringing to scale low-carbon and industrial removal technologies that can enable large-scale decarbonization. However, portfolios of corporate mitigation strategies that optimize across abatement, compensation, and neutralization—in light of technological

feasibility and cost-effectiveness—must be structured to ensure that all sectors are on track to achieve the collective goal of global net-zero emissions by 2050. In other words, early investment in NBS to compensate for hard-to-abate emissions in the near term could be a feature of corporate pathways to achieving net zero; however, such efforts must not compromise on achieving the Paris Agreement's ultimate objective of stabilizing Earth's temperature.

Conclusions

Combating climate change requires immediate decarbonization across all sectors. By combining aggressive direct fossil fuel abatement with investments in NBS, companies can be part of a "both/and" approach to achieving society's global net-zero emissions goal. As the standards and norms surrounding the use of NBS as offsets continue to develop, companies can advance their own contributions in three ways: implementing ambitious strategies for reducing emissions within their value chains (operations, supply chain, and use of products); signaling demand for high-quality NBS to compensate for and neutralize remaining emissions; and advocating for robust rules to govern voluntary and compliance-based transactions of NBS credits for use as offsets.

1. WHAT IS THE CONTEXT FOR DEVELOPING CORPORATE MITIGATION STRATEGIES?

In the 2015 Paris Agreement, nearly 200 countries unanimously agreed to limit the increase in global temperature relative to preindustrial levels to well below 2°C and committed to pursue efforts to limit temperature increase to 1.5°C by balancing emissions and removals by the second half of the century (UNFCCC 2015). Just a few years later, the Intergovernmental Panel on Climate Change (IPCC) made clear in its Special Report *Global Warming of 1.5°C* (IPCC 2018) that meeting the more ambitious target was essential to reducing the risk of the most dangerous and irreversible impacts of climate change. The report further described what was needed to shift towards a 1.5°C pathway: a historically unprecedented mobilization of investment, technology, and behavioral change to reduce emissions to net zero[3] by 2050.

Several more recent reports have analyzed potential pathways to net zero for different economic sectors as well as the role of private business in society's transition to net zero more generally (ETC 2018; Henderson et al. 2020). Although these reports conclude that such a transition is technically and economically feasible, all highlight the need for rapid decarbonization across all sectors, including those currently generating emissions from fossil fuels and land use, and the need to rely on carbon removal activities.

> **Key takeaway:** Nature-based solutions cannot substitute for or delay implementing significant abatement of fossil fuel emissions.

In response to changing expectations from shareholders, consumers, and other stakeholders for corporate climate action, many companies are now developing decarbonization strategies and setting net-zero targets. In assessing these voluntary corporate climate commitments, it is important to consider the range of emissions sources and activities included as well as the proposed pathways to achieving net zero.

Most companies include what are called scope 1 and 2 emissions in their strategies. Scope 1 emissions are direct emissions from sources that are owned or controlled by the entity. Scope 2 emissions are indirect emissions from the production of energy that is purchased but not owned or controlled by the entity. However, in many cases scope 3 emissions, or emissions that occur in the upstream and downstream value chain of the entity, make up a majority of the company's emissions. Common scope 3 emissions include suppliers' raw materials (e.g., steel for cars) and consumers' use of products (e.g., electricity for appliances). Some corporate climate commitments include the purchase of carbon credits in addition to directly reducing scope 1, 2, and 3 emissions. Such a purchase, and subsequent retirement, is called a carbon offset when a reduction in greenhouse gas (GHG) emissions or an increase in carbon storage is used to compensate for emissions that occur elsewhere (Broekhoff et al. 2019).

The so-called mitigation hierarchy is used to prioritize certain climate actions over others (Stevenson and Webb 2020). In the context of achieving net-zero emissions, this means prioritizing fossil fuel emissions reductions before investing in carbon dioxide (CO_2) removal technologies as well as prioritizing actions within a company's value chain emissions (i.e., scope 1, 2, and 3 emissions) before turning to offsets (SBTi 2020). Nature-based solutions (NBS) must be included in the climate strategies of companies that have land sector impacts *within* their value chains. Although this paper will focus on financing NBS *outside* of a company's value chain for use as offsets, we recognize that NBS financing is not necessarily associated with offsetting.

Table A1 (presented in Appendix A) compares commitments made by Shell, Microsoft, and Nestlé, which differ in ambition, scope, timeline, and actions as well as the degree to which they plan to rely on NBS to achieve their goals. These differences reflect how companies in different sectors face different constraints and opportunities for decarbonization. In addition, they show that consensus on what net zero means for individual companies—and how it relates to society-wide net-zero targets—is still evolving.

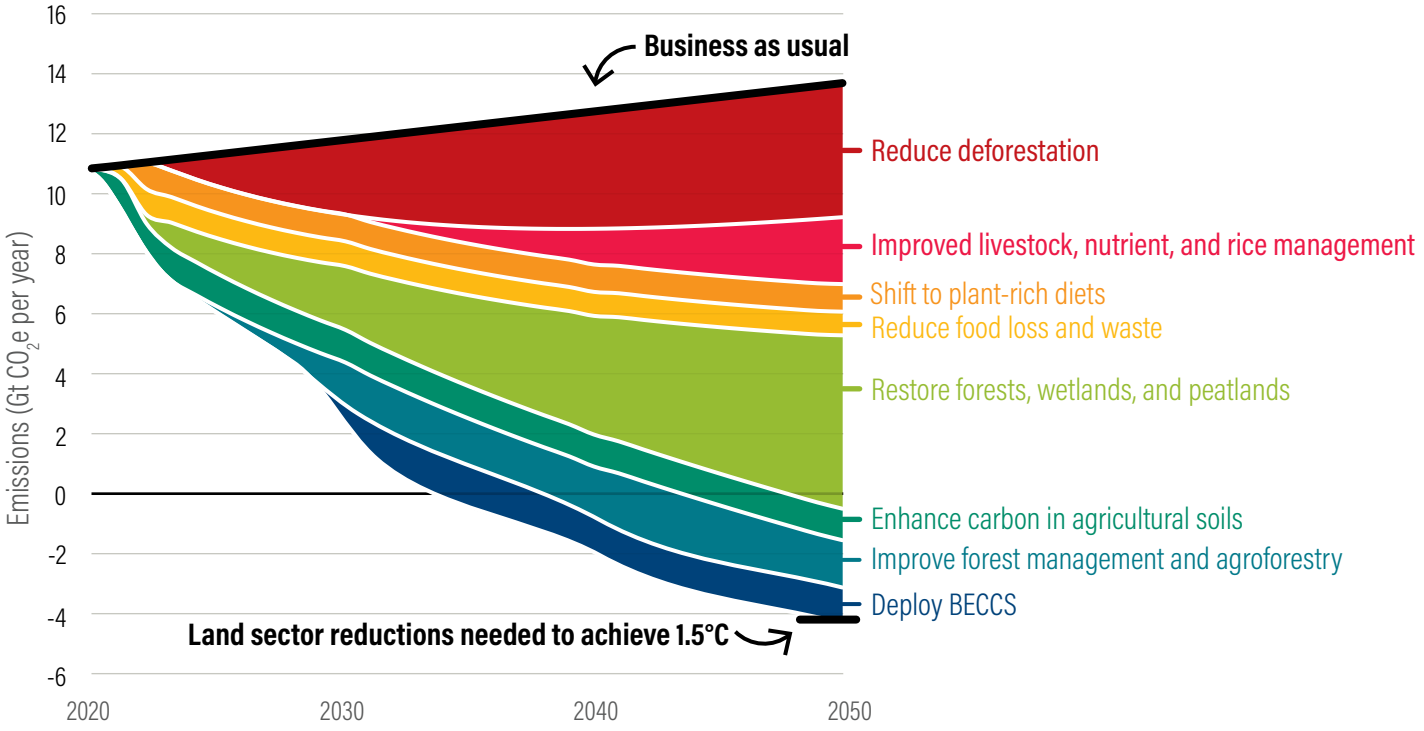
It is important to distinguish among NBS, *carbon removal*, and *offsetting* because the terms are not interchangeable. NBS can be financed through various mechanisms that include, but are not limited to, offsets. Similarly, offsets can represent emissions reductions or removals and are not limited to NBS activities. Carbon removal can occur via NBS or industrial technologies. This paper focuses on considerations for the use of NBS as offsets, with the understanding that there are other types of offsets as well as other modes of financing NBS.

Key takeaway: Major companies are incorporating NBS offsets into voluntary climate mitigation targets and strategies even while standards and norms are under development.

2. WHAT ARE NBS, AND WHY ARE THEY IMPORTANT?

NBS are defined by the International Union for Conservation of Nature as "actions to protect, sustainably manage, and restore natural or modified ecosystems, that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits" (IUCN n.d.). Although estimates vary, NBS could provide approximately one-third of the cost-effective climate mitigation needed to deliver on the 1.5°C target (Griscom et al. 2017; Roe et al. 2019). As seen in Figure 1, NBS such as reduced deforestation and restoration of forests, wetlands, and peatlands complement activities focused on reducing consumption pressures on land, such as shifting to plant-rich diets, to achieve the 1.5°C target.

Figure 1 | **The Climate Mitigation Potential of NBS**



Note: BECCS = bioenergy with carbon capture and storage. Each wedge is accounted individually to avoid double counting. *Business as usual* assumes a continuation of current emissions from land-use change and median projected emissions from agriculture.
Source: Roe et al. 2019.

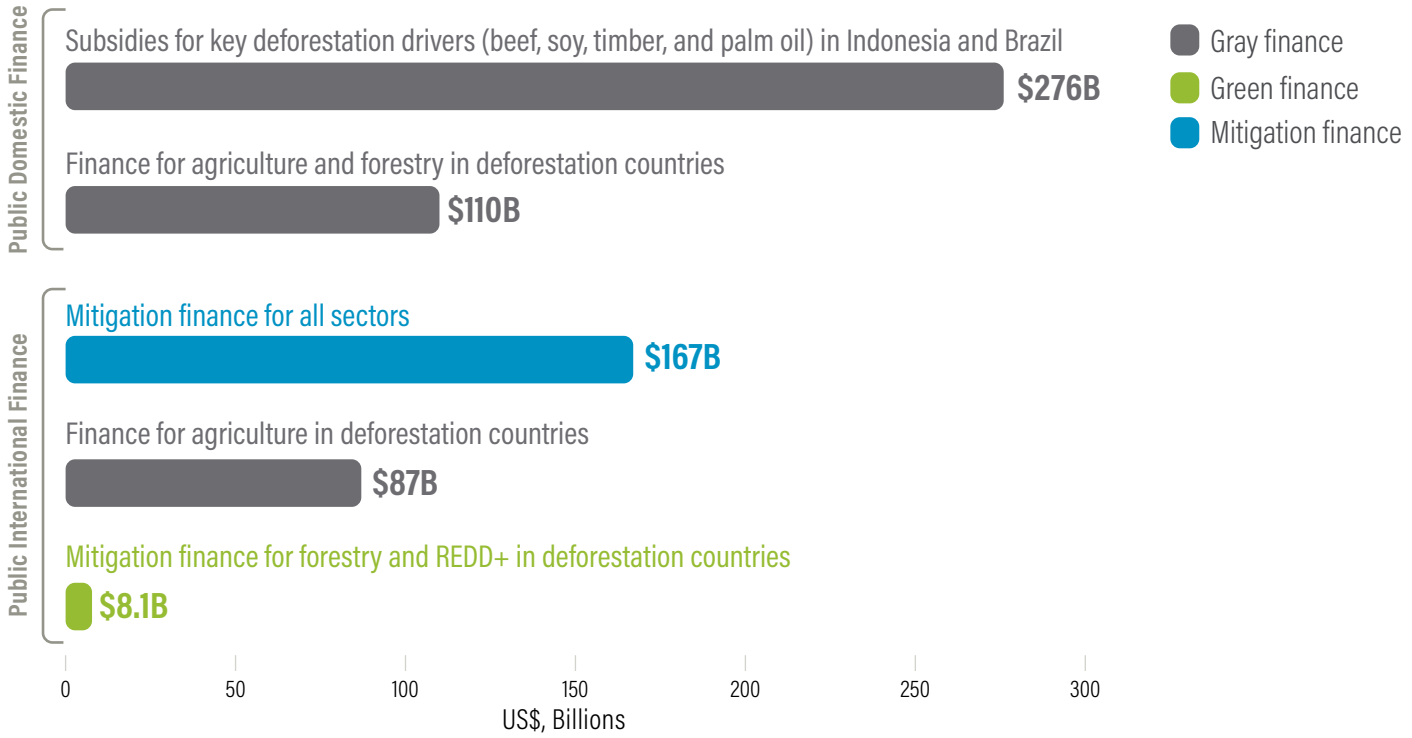
Within this suite of NBS options, conserving natural ecosystems must be a priority for several reasons. The IPCC Special Report *Climate Change and Land* concluded that reducing rates of deforestation and forest degradation "represents one of the most effective and robust options for climate change mitigation" (IPCC 2019). It also noted that improved forest management and reduced deforestation and degradation were among the few land-based mitigation options that provide unambiguously positive contributions to climate adaptation, biodiversity conservation, and other Sustainable Development Goals (SDGs).

Further, protecting remaining intact ecosystems must be front-loaded in society's pathway to net zero. Carbon released into the atmosphere from the conversion of carbon-dense ecosystems such as tropical forests, peatlands, and mangroves is "irrecoverable" through restoration between now and 2050 (Goldstein et al. 2020). Failure to protect these ecosystems within the next ten years would make it virtually impossible to stay within the global carbon budget. Because many natural ecosystems could themselves be affected by climate change in ways that may render them less able to store carbon in the future (Anderegg et al. 2020), protecting them now is essential to curtail emissions from land-use change and buy valuable time to develop additional mitigation and adaptation options.

NBS finance is dwarfed by financial flows to agriculture and other sectors that can lead to the conversion and degradation of natural ecosystems. As illustrated in Figure 2, efforts to fight tropical deforestation have received less than 3 percent of international climate mitigation finance: roughly US$20 billion since 2010 (Climate Focus 2017). In comparison, other components of the land sector have received roughly $777 billion in "gray finance"—that is, finance that is not linked to improving environmental outcomes—over the same period (Climate Focus 2017).

> **Key takeaway:** NBS are a critical and time-sensitive component of delivering on global climate goals, but the financial flows supporting them are not commensurate with their mitigation potential.

Figure 2 | **Forests as an Example of Limited NBS Finance Compared to Other Financial Flows (2010–2017)**



Note: Mitigation finance for forestry in deforestation countries consists of development finance ($2.3B) as well as REDD+ readiness and implementation finance ($1.7B) and results-based finance commitments ($4.1B).
Source: Climate Focus 2017.

3. WHAT ARE THE UNIQUE ATTRIBUTES OF NBS?

Although the atmospheric carbon budget is indifferent to the sources of emissions reductions and removals ("a ton is a ton is a ton"), the actual impacts on climate across geographic scales and on human well-being are not. Compared to industrial emissions reduction and removal technologies, investments in NBS can generate significant cobenefits for the climate, ecosystem services, and biodiversity in addition to benefits for local communities and national economies. The size and characteristics of those benefits vary across types of NBS.

First, NBS can enhance climate stability in ways other than through carbon storage. Complex interrelationships between forests and the atmosphere are mediated through factors such as reflection of sunlight, influence on wind patterns, and evaporation of water. New research is revealing how forests generate rainfall at continental scales and moderate temperature extremes locally, both of which can impact agricultural productivity (Lawrence and Vandecar 2015; Zeppetello et al. 2020). For businesses dependent on the sustainable management of natural resources, these non-GHG pathways through which forests promote climate stability offer synergies with corporate management of physical risks resulting from climate change.

Second, NBS can generate significant cobenefits for biodiversity, adaptation, and other SDGs. Carbon density is highly correlated with biodiversity in natural ecosystems (Di Marco et al. 2018). Protection of biodiversity is essential to maintain the ecosystem functions that sustain global food systems (e.g., via pollination) as well as human health, as dramatically demonstrated by the COVID-19 pandemic. Additionally, wetlands and forested watersheds attenuate floods and droughts, mangroves protect coastal communities from storm surges, and forests moderate local air temperature and soften the health impacts of urban heatwaves (Lawrence and Vandecar 2015; Salmond et al. 2016). Forests also provide an important source of direct income for local communities by providing fuelwood, food, and fiber (Angelsen et al. 2014). Box 1 describes the challenges of valuing such cobenefits in carbon markets.

Third, NBS can help countries build back better after the economic crisis precipitated by the coronavirus pandemic. Incorporating NBS into recovery plans can deliver significant economic gains and provide immediate job opportunities by restoring and protecting nature and implementing critical natural infrastructure projects (Cook and Taylor 2020). For example, protecting and restoring mangroves provides $80 billion per year in avoided losses from coastal flooding globally and an additional $40–$50 billion per year in nonmarket benefits associated with fisheries, forestry, and recreation (Global Commission on Adaptation 2019).

> **Key takeaway:** NBS can deliver significant benefits for climate stability, SDGs, and economic recovery above and beyond carbon storage.

The size and composition of carbon and other benefits differ across different types of NBS. Of highest near-term priority for global climate mitigation is conserving tropical forests, peatlands, and mangroves due to their high and often irrecoverable carbon stocks. Tropical forests sequester more carbon than their temperate counterparts, and peatlands and mangroves store up to five times more carbon than terrestrial forests (Donato et al. 2011; Pan et al. 2011). These irreplaceable ecosystems are in urgent need of protection and planting trees elsewhere cannot

Box 1 | The Importance of Valuing the Noncarbon Benefits of Nature-Based Solutions

Although the significant cobenefits of nature-based solutions (NBS) for emissions reductions and removals are widely understood, it has proven difficult to quantify and monetize them, especially in the context of carbon credits. Integrating values that cannot be measured in CO_2 equivalents means that the resulting credits are not fungible with non-NBS carbon credits in accounting systems or compliance markets. Nevertheless, there is evidence that NBS credits attract a price premium in voluntary markets.

Prices for NBS credits increased approximately 30 percent in 2019, reflecting strong demand and higher prices for credits associated with cobenefits such as support of indigenous peoples, job creation, and enhanced biodiversity.[a] Carbon crediting programs have begun developing standards for certifying the quantitative SDG impacts of projects for outcomes related to water, health, gender equality and other goals, but these standards are not yet in wide use.[b]

Sources: a. Ecosystem Marketplace 2020; b. Gold Standard n.d.; Verra n.d.

compensate for the losses of biodiversity and ecosystem services that accompany emissions from forest and wetland conversion.

Risks associated with NBS can also differ by type of activity. Poorly designed afforestation and reforestation can put food security at risk by converting potential cropland and pastures to forests and driving up food prices. Planting non-native species, monoculture crops, or biofuel feedstock can reduce biodiversity and climate resiliency without significant carbon sequestration benefits (IPCC 2019). Table 1 provides illustrative examples of how different types of NBS vary by global mitigation potential and benefits for adaptation, biodiversity, and food security.

A number of companies have incorporated NBS in their corporate mitigation strategies with a focus on removals only, but both ecosystem protection (emissions reductions) and restoration (removals) are needed to avert catastrophic climate change. Just as it is important for energy and industry sector companies to pursue portfolios of actions that include reducing current fossil fuel emissions and investing in low-carbon technologies to reduce emissions in the future, the land sector needs to reduce current emissions and invest in restoration that will result in future removals. Due to the accumulation of emissions in the atmosphere, avoiding the huge pulse of emissions from the conversion of forests and other carbon-dense ecosystems to other uses in the near term has a larger climate mitigation impact than planting trees that will pull carbon out of the air gradually over the course of decades. Whereas preventing the loss of one hectare of mature forests avoids approximately 100 tons of CO_2, tropical reforestation on average sequesters only 3 percent of that amount annually. This means that in a given year 30 times more land is needed for reforestation to generate the same mitigation outcomes as avoided deforestation (IPCC 2018).

> **Key takeaway:** Companies should include in their portfolios of NBS investments both urgently needed near-term emissions reductions as well as investments in removals that will pay off in the long term.

Table 1 | **NBS Differ across Benefits and Risks—Illustrative Comparisons**

NATURE-BASED SOLUTIONS	GLOBAL GREENHOUSE GAS MITIGATION POTENTIAL	ADAPTATION BENEFITS	BIODIVERSITY CONSERVATION BENEFITS	FOOD SECURITY BENEFITS
Reduced deforestation and degradation	High	Medium	High	Low
Reforestation and restoration	High	High	High/medium; depends on use of native species	Variable[a]
Sustainable forest management	Medium; depends on end use of forest products	High	High/medium	Medium
Agroforestry	High	High	Medium	High
Improved cropland and livestock management	Medium	High	Low	High
Conservation and restoration of coastal wetlands	High	High	Medium	Variable[a]
Large-scale commercial bioenergy	Variable[a]	Low	Negative	Negative
Large-scale afforestation	Variable[a]	High	Negative	Negative

Note: a. Depends on whether activity competes for land with agricultural production and/or displaces production into carbon-dense ecosystems.
Source: WRI authors based on IPCC 2019 and IPBES 2019.

4. WHY IS FURTHER GUIDANCE NEEDED ON THE USE OF NBS AS OFFSETS?

The inclusion of NBS in corporate mitigation strategies could provide much-needed finance for nature conservation and restoration. However, challenges remain in defining the appropriate time frames for voluntary emissions reduction targets, the scope of activities included, the GHGs covered, and mitigation approaches to meet targets, including any role for offsets (SBTi 2019). The appropriate use of NBS as offsets may also differ by sector, as described in Section 5. At the same time, the inclusion of NBS in compliance markets remains nascent, as described in Section 8, so the rules that govern official NBS crediting remain uncertain. This section identifies key areas in which clear guidance and/or consensus have not yet emerged.

The first such area relates to how companies should account for land-based emissions and removals within their own value chains. The Greenhouse Gas (GHG) Protocol (see Box 2) is recognized as an authoritative source of standards for accounting and reporting on the measurement and management of GHG emissions. However, the initiative is still in the process of developing guidance to clarify methods to account for emissions from the land sector. Such guidance is especially needed by companies such as those in the food and beverage industry, which have supply chains tied to agriculture.

Box 2 | The Greenhouse Gas Protocol Provides Standards and Guidance to Measure and Manage Emissions

The Greenhouse Gas (GHG) Protocol is a partnership between World Resources Institute (WRI) and the World Business Council for Sustainable Development. The GHG Protocol provides accounting and reporting standards, sector guidance, calculation tools, and trainings for businesses and governments. The standards include tools for measuring and managing emissions from private and public sector operations, value chains, products, cities, and policies. The GHG Protocol is in the process of developing new standards and guidance on how companies should account for aspects such as land use, land-use change, carbon removals, and sequestration within and outside of their GHG inventory boundaries. The guidance is expected to be published by the end of 2021.

Some companies include "insetting" as part of their climate mitigation strategies, including NBS such as planting trees to generate carbon removals. Although there is no standard definition, insetting is often characterized by emissions reductions or removals that are within the scope 3 emissions boundaries of a company (WWF 2019). Insetting projects are particularly challenging to quantify; to avoid double counting, their impacts on emissions cannot be included in another company's emissions accounting. Further work is required to standardize the definition of insetting and to develop a clear accounting methodology.

A second area where further guidance is needed relates to society's expectations regarding how much companies need to abate their own fossil fuel emissions before being "eligible" to compensate for remaining emissions by purchasing carbon credits for use as offsets. As described in Section 1, the science is clear that there is no room to substitute emissions reductions in one sector for those of another if society is to meet the goals of the Paris Agreement. No economic sectors are currently on track to achieve their share of the emissions reductions necessary to avert catastrophic climate change. Yet even when recognizing the need for "both/and" solutions, questions remain regarding how quickly companies should be expected to decarbonize their value chains in light of the availability and cost of abatement technologies. One set of answers to these questions is provided by the Science-Based Targets initiative (SBTi), described in Box 3.

However, different sectors face different constraints and opportunities for reducing emissions and getting to net zero. For some industries, such as aviation and shipping, steep decarbonization is currently challenging given the relatively limited investment to date in low-carbon alternatives compared to fossil fuel–based incumbent technologies. Stronger policy incentives and significant investments are needed to foster more rapid commercialization and scaling of these low-carbon technologies. Even for "easier-to-abate" emissions, such as those from light-duty vehicles that can be electrified, achieving emissions reductions will require transitions measured in years; this is due to the turnover rate of existing capital stocks (such as vehicle fleets) and the time needed to develop supporting infrastructure (such as charging stations). In the meantime, compensating for some or all remaining emissions with the purchase of NBS credits could be part of a "both/and" strategy. The SBTi recognizes the need to differentiate among sectors and has begun publishing

Box 3 | The Science-Based Targets initiative

The Science-Based Targets initiative (SBTi) helps companies set GHG emissions reduction targets in line with climate science. The SBTi is a collaboration between CDP,[a] the United Nations Global Compact, World Resources Institute, and the World Wide Fund for Nature. The initiative defines and promotes best practices in science-based target setting, offers resources and guidance to reduce barriers to adoption, and independently reviews and approves companies' targets.

A "science-based" target is one that results in emissions reductions commensurate with what is needed to achieve the temperature goals of the Paris Agreement. Thus, the default trajectory under the SBTi would be for a company to reduce its annual emissions at an average rate of 2.5 percent to be consistent with a 2°C goal or 4.2 percent for a 1.5°C goal. By the end of 2020, more than 1,100 companies had committed to taking science-based climate action, and half of them had approved targets.

Note: a. Formerly known as the Carbon Disclosure Project.

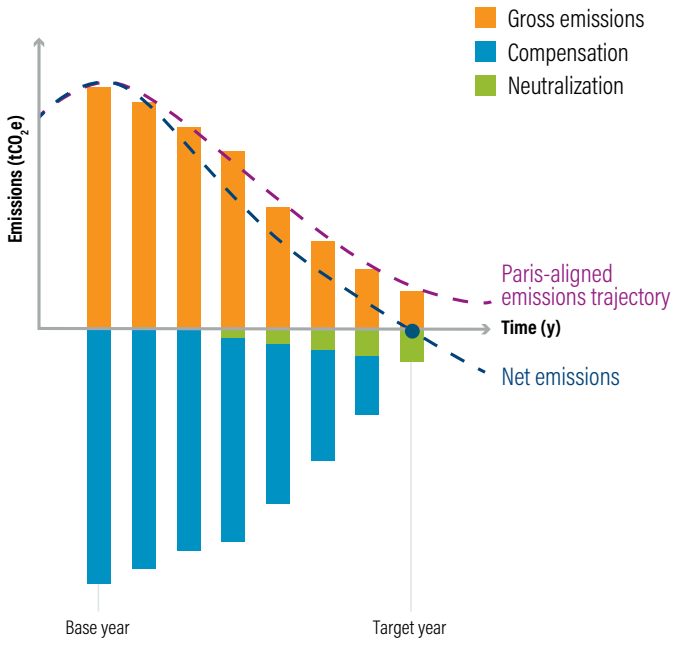
sector-specific guidance. While such guidance exists for a few sectors, including power, guidance for others, including transport and oil and gas, remain in the development or scoping phases.

A third and related area where further guidance is needed relates to net-zero targets and strategies. The SBTi has recently published a set of guiding principles to ensure that corporate net-zero targets are consistent with the transformation required to transition towards a net-zero economy (SBTi 2020a). Initial guidance from the SBTi assesses five hypothetical approaches companies could use to seek or claim climate neutrality (SBTi 2020a). Each strategy uses a different combination of emissions abatement, compensation, and neutralization to achieve net zero. Emissions **abatement** includes measures that prevent the release of GHG emissions within the operations of the company and its value chain. **Compensation** measures include GHG emissions reductions as a result of financing activities external to the company's value chain. Finally, **neutralization** measures include the removal and permanent storage of GHG emissions that "neutralize" a company's emissions. The SBTi's preferred "climate-positive" strategy is illustrated in Figure 3, in which offsets are not allowed to substitute for abatement but could be used to compensate or neutralize remaining emissions.

However, the actual shapes of Paris-aligned emissions reduction trajectories remain uncertain, especially for companies in sectors for which guidance is not yet available. In other words, how much absolute emissions must be abated at each point in the trajectory prior to the legitimate use of offsets to compensate or neutralize those that remain? And what claims could be made based on offsetting some or all remaining emissions en route to achieving net zero? Further, although it is clear that an early emphasis on compensation for residual emissions (including reducing emissions from nature) must shift to exclusively neutralization (including carbon removals by nature), the appropriate pace of that transition and how it may vary across companies remains unclear.

> **Key takeaway:** Definitive guidance to companies on the necessary level of abatement prior to the legitimate use of offsets to compensate for remaining emissions is not yet available.

Figure 3 | Compensation and Neutralization Offsets in Net-Zero Emissions Strategies



Notes: Gross emissions include scope 1, 2, and 3 emissions; *compensation* includes measures that companies take to prevent, reduce, or eliminate sources of greenhouse gas emissions external to their value chain; *neutralization* includes measures that companies take to remove (additional) carbon from the atmosphere.
Source: SBTi 2020a.

A fourth and final set of issues requiring further guidance is how the voluntary use of NBS as offsets should articulate with emerging domestic and international compliance markets. At least four different circumstances determine the current and prospective use of NBS as offsets by companies. Different considerations may apply depending on whether NBS credits are purchased voluntarily or to meet compliance obligations and whether title to the credits is transferred abroad. Table 2 categorizes different combinations of these circumstances; how activities in each of the four quadrants should relate to each other remains a matter of debate.

Table 2 | **Distinctions among Markets for NBS Offsets**

	VOLUNTARY	COMPLIANCE
Domestic	NBS credits purchased by companies to meet voluntary, unregulated commitments to compensate emissions within national borders	NBS credits purchased by companies to meet compliance obligations within national borders
International	NBS credits purchased by companies to meet voluntary, unregulated commitments with source of emissions in another national jurisdiction	NBS credits purchased by companies to meet compliance obligations in another national jurisdiction

Note: NBS = nature-based solutions.
Source: WRI authors.

For example, should approaches to avoid the double counting of credits across countries also apply to voluntary purchases used to support corporate claims? Article 6 of the Paris Agreement recognizes that countries may pursue international cooperation in achieving national emissions reduction targets, and UNFCCC negotiators have developed guidance requiring that "corresponding adjustments" to national-level emissions accounting be made when credits are transferred from one country to another.[4] However, negotiations on the rules for implementing Article 6 are not yet complete. In the meantime, there is no consensus about whether corresponding adjustments are needed for credits used to achieve voluntary corporate commitments and to support associated claims. Additionally, the institutional infrastructure for making such accounting adjustments remains undeveloped in most countries. As the Paris Agreement comes into effect, and an increasing proportion of emissions are subject to compliance obligations, the interaction between corporate and country-level emissions accounting will need to be clarified (EDF 2020a).

Further, there is uncertainty about the future of project-scale REDD+ (reducing emissions from deforestation and forest degradation) credits. Whereas corporate purchases of international forest carbon credits to date have been credited at the project scale, compliance markets such as the International Civil Aviation Organization's Carbon Offsetting and Reduction Scheme for International Aviation (ICAO CORSIA)[5] have begun to establish eligibility standards for crediting such offsets at the jurisdictional scale (see Box 5), consistent with the REDD+ framework negotiated under the UNFCCC. Questions also remain about how project-level crediting in domestic compliance markets such as Colombia's (see Box 4) will articulate with jurisdictional-scale crediting for international markets.

> **Key takeaway:** Key questions regarding the intersection of voluntary and compliance markets for NBS credits, especially for international transfers, remain unresolved.

5. HOW DO THE POTENTIAL USES OF NBS DIFFER BY SECTOR?

To date, companies have incorporated NBS as offsets into their mitigation strategies in a number of different ways, as illustrated in Table A1. These differences often reflect factors that vary across sectors, such as the availability of abatement options within a company's scope 1, 2, and 3 emissions and the potential for synergies with other corporate objectives, including management of climate and other risks related to land-use change. Differences can also vary among companies within the same sector, such as the type of target a company sets and the types of claims the company seeks to make, including branding opportunities associated with NBS credits from particular activities or geographies. Below, we highlight several factors that may lead to differing uses of NBS as offsets by sector.

The first factor influencing the use of NBS as offsets is the degree to which a company must address genuinely hard-to-abate emissions. Such emissions likely imply a

greater reliance on compensation activities, including via NBS, while awaiting the fruits of investment in developing and scaling up new technologies for abatement and neutralization. The definition of *hard-to-abate* will change with advances in technology and reductions in cost, and it should be reassessed periodically to increase ambition for the pace of abatement.

Sectors with significant hard-to-abate emissions are defined by the *Mission Possible* report as including cement, steel, plastics, chemicals, heavy-duty road transport, maritime shipping, and aviation (ETC 2018).[6] In many discussions, the oil and gas sector is assumed to be difficult to decarbonize, but it is important to distinguish among end uses for fossil fuel products when classifying whether emissions are hard to abate. The different subsectors of oil and gas users, such as light-duty road, aviation, shipping, and rail, will require different near-, mid-, and long-term actions on their pathways to net zero (EDF 2020b). Hard-to-abate emissions also exist within otherwise easy-to-abate sectors, particularly in the near term. For example, service-oriented companies that have relatively small direct carbon footprints but have employees who travel for work will still need to compensate or neutralize associated emissions to achieve net zero.

A second factor influencing the use of NBS is the potential for synergies with other corporate objectives, particularly the management of climate-related physical risks and other risks related to land-use change. Companies reliant on agriculture, forestry, and other land-use activities are a case in point. Such companies face the threefold challenge of reducing emissions from such activities (which now account for almost a quarter of global GHG emissions), even while increasing production to feed a growing population and increasing resilience to climate change (Searchinger et al. 2019). Many companies have already committed to getting deforestation out of their supply chains (NYDF Assessment Partners 2019).

Activities such as improved agroforestry and silvopastoral systems incorporate natural carbon sequestration into agricultural land uses and can increase productivity of the land while providing climate mitigation and adaptation benefits (Searchinger and Ranganathan 2020). The SBTi is working with the GHG Protocol to develop new guidance that will offer companies with land-use emissions options for accounting for carbon sequestration actions within corporate supply chains. Specifically, the future guidance will help companies prioritize actions to reduce their Scope 3 emissions while also enhancing the resilience of their supply chains. However, the resulting emissions reductions cannot be used as offsets because they are occurring within the companies' value chains.

More generally, the association of investment in NBS with managing climate-related physical risks and other risks related to land-use change is of particular interest to the finance sector. Although financial institutions produce very few emissions themselves, they have trillions of dollars in assets consisting of companies that contribute to global GHG emissions and also face varying degrees of associated physical risk. Such institutions are beginning to integrate climate-related risks into their investment decisions and are working to decarbonize their portfolios. For example, 33 institutional investors have joined the Net-Zero Asset Owner Alliance convened by the United Nations (UNEPFI n.d.).

Several initiatives provide related guidance to the financial sector, which in turn influences the risk disclosures that financial institutions require from companies. For example, the SBTi is developing a framework for the financial sector that will focus on connecting financial flows with GHG emissions reductions and provide guidance on physical risk assessment, target setting, and disclosure (SBTi 2020a). The Task Force on Climate-related Financial Disclosure provides recommendations to help companies report on the risks that climate change poses to business operations (TCFD n.d.). Additionally, to help companies properly value the benefits that nature provides and the risks associated with destroying it, a Task Force on Nature-related Financial Disclosures was launched in July 2020 to help the financial sector report on risks and impacts associated with nature and biodiversity (TNFD n.d.). Due to the high biodiversity value of intact ecosystems (Watson et al. 2018), such guidance can be expected to increase attention to NBS compensation (e.g., finance of conservation of forests) rather than NBS neutralization (e.g., finance of tree planting).

> **Key takeaway:** The appropriate use of NBS offsets will differ by sector and over time.

6. WHAT ARE THE CONCERNS ABOUT USING NBS AS OFFSETS?

The use of offsets of any kind in corporate mitigation strategies raises two concerns. The first concern is that companies will use offsets as a lower-cost substitute for reducing emissions within their value chains to reach certain targets and/or to invest in low-carbon alternatives, thereby delaying future abatement. Such practices could increase net emissions at the firm level compared to what would have happened without the availability of offsets and/or delay society's progress towards net-zero emissions. A key challenge is how to ensure "demand-side environmental integrity"—in other words, ensuring that the use of offsets enhances rather than dilutes climate action. The second concern is that the carbon credit used as an offset will not be of sufficiently high quality to ensure a real reduction in emissions to the atmosphere. Ensuring this "supply-side environmental integrity" depends on addressing issues such as additionality (emissions reductions and removals must be additional to what would have happened in a business-as-usual scenario), leakage (activities that cause emissions are not simply displaced elsewhere), permanence (reversal risks are mitigated), and double counting (credits are used only once towards a climate target).

In addition to ensuring the environmental integrity of offsets, important social integrity concerns should be considered on both the supply and demand sides to ensure a just transition to sustainability. Climate change often exacerbates inequalities, leaving vulnerable populations to deal with unhealthy air, unsafe water, or degraded ecosystems. Efforts to mitigate climate change can also have unintended negative consequences for local communities. It is therefore imperative that companies consider social integrity when purchasing offsets, including NBS.

> **Key takeaway:** Responsible offsetting requires attention to environmental and social integrity on both the demand and supply sides.

As illustrated in Table B1 (presented in Appendix B), none of the concerns related to environmental or social integrity is unique to NBS offsets. Demand-side environmental integrity issues could be raised by a company's use of offsets from any source if unaccompanied by sufficient effort to reduce its own emissions. Offsets based on avoided industrial emissions could also raise supply-side environmental integrity issues or social integrity concerns. Although it is challenging to compare jurisdictional-scale REDD+ programs to renewable energy projects, both entail risks related to leakage, permanence, additionality, and uncertainty. For example, whereas forests are vulnerable to reversals due to natural disturbances such as fires and storms, windmills and hydroelectric turbines can be idled due to climatic variations in wind patterns and drought, respectively (Espejo et al. 2020). Nevertheless, NBS offsets are often perceived as especially risky or ineffective as a means to achieve climate ambition.

As described in Section 7, strategies are available for managing these risks. Although many questions about how to manage demand-side risk remain unresolved, approaches for addressing supply-side risk for NBS credits are well advanced.

One concern that is particularly salient to the use of NBS as offsets is the issue of land-use competition. Competition for land is increasing as a growing global population demands additional food and fiber production, which in turn increases the risk that land used for carbon sequestration will cause trade-offs with other land uses. NBS such as agroforestry and protecting and restoring degraded forests and wetlands maintain original land uses while also increasing carbon sequestration and thus minimize such trade-offs. The *World Resources Report: Creating a Sustainable Food Future* lays out a five-course "menu" of options to reduce emissions and relieve pressure on land, some of which include NBS (Searchinger et al. 2019).

> **Key takeaway:** NBS offsets are often perceived as inherently more risky than other sources of offsets.

7. WHAT RISK MANAGEMENT MEASURES SHOULD ACCOMPANY THE USE OF NBS AS OFFSETS?

To ensure both the environmental and social integrity of NBS as offsets in corporate mitigation strategies, companies must address the risks associated with purchasing NBS credits. As described above, the first type of risks to be managed relates to the need to ensure that any use of offsets is complementary to, rather than a substitute for, abatement of current emissions and investment in new technologies. If companies are perceived to be using offsets to avoid or delay currently feasible reductions in fossil fuel emissions, the use of offsets will be seen as illegitimate and will undermine the credibility of the companies' climate action. Table 3 summarizes approaches to managing demand-side risk.

Key takeaway: Companies can take many steps to build confidence that the use of NBS as offsets is not a substitute for reducing their own emissions.

Table 3 | **Approaches to Managing Demand-Side Risk**

CONCERN	ILLUSTRATIVE SOLUTIONS
Reduced climate ambition	Companies can build confidence that the use of NBS offsets are a complement to, rather than a delay tactic or substitute for, aggressive efforts to reduce fossil fuel emissions. ■ Companies publish and regularly update a credible decarbonization strategy for reducing their own emissions (scopes 1, 2, and 3[a]), ideally with a Paris-aligned target (SBTi) ■ Company leadership pledges to reach net zero by midcentury at the latest (e.g., Race to Zero, United Nations Global Compact 1.5°C pledge) ■ Companies take immediate action towards achieving net zero, detail the reduction approaches, set interim targets, and demonstrate how NBS as offsets are a transition strategy to compensate "residual" emissions (Race to Zero)
Lack of transparency	Companies can disclose information on implementation that is sufficiently detailed and timely for stakeholders to monitor progress. ■ Companies publish independently verified annual reports on progress in implementing their own emissions reductions (in line with CDP and Task Force on Climate-related Financial Disclosure reporting requirements) ■ Companies report progress at least annually (Race to Zero) ■ Companies disclose information regarding types and sources of offsets
Lack of coherence in corporate strategy	Companies can ensure that all corporate strategies are aligned with Paris Agreement goals. ■ Companies commit to an investment strategy aligned with their climate strategy (e.g., energy companies commit to an increasing percentage of investments allocated to clean fuels versus fossil fuel development) ■ Companies establish key performance indicators consistent with climate strategies and incentivize employees (e.g., annual bonuses) based on achievements ■ Companies commit to avoid any lobbying, direct or through trade associations, related to climate policy that is inconsistent with a Paris-aligned future[b]
Misleading claims	Companies can ensure that any claims based on the integration of NBS offsets into mitigation strategies do not mislead consumers or other stakeholders. ■ Companies ensure that NBS-related claims adhere to the International Social and Environmental Accreditation and Labeling Alliance principles and guidance for sustainability claims (i.e., transparency, relevance, impartiality, engagement, and truthfulness) and emerging guidance on the use of terms such as "carbon neutral" ■ Companies ensure that marketing of "carbon neutral" products do not result in a rebound effect of increased consumption of emissions-intensive goods

Notes: NBS = nature-based solutions.
a. "If a company has significant scope 3 emissions (over 40% of total scope 1, 2 and 3 emissions), it should set a scope 3 target" (SBTi 2020b).
b. EDF 2019.
Source: WRI authors.

The second type of risk to be managed relates to ensuring the quality of NBS credits to be used as offsets. In order to compensate for fossil fuel emissions, the underlying emissions reductions and removals must be of high quality and avoid unintended harm. Approaches include transparent methods for managing the risks of leakage, impermanence, the uncertainty of measurement, and double counting, as well as implementing social safeguards.

Principles and actions to mitigate these concerns and systems for verifying the integrity of NBS credits have already been well advanced through the UNFCCC REDD+ negotiations, compliance regimes such as ICAO CORSIA, the design of various public sector programs (such as the Forest Carbon Partnership Facility's Carbon Fund methodological framework[7]), and voluntary initiatives (such as The REDD+ Environmental Excellence Standard of the Architecture for REDD+ Transactions[8]). Nevertheless, such standards should be subject to periodic update in light of experience and as available data and methods improve. Table 4 lists the supply-side risks and risk management approaches to ensure that any purchased NBS credits are of high quality. Companies should purchase NBS credits that are certified by programs with robust systems for verifying that credit suppliers adhere to standards that embody such approaches. As described in Box 5, many supply-side risks can be addressed by a rapid transition from project-based crediting to jurisdictional-scale crediting, ultimately at the national scale.

Key takeaway: Companies can ensure the integrity of NBS offsets by purchasing only credits that are certified by programs adhering to high-quality standards.

Table 4 | **Approaches to Managing Supply-Side Risk**

CONCERN	APPROACHES TO RISK MANAGEMENT
Leakage	Ensure that activities that generate emissions are not simply displaced: ■ Discount crediting to reflect the assessed risk of direct and indirect leakage ■ Credit at the scale of national or large subnational jurisdictions
Permanence	Ensure that emissions reductions and removals are not reversed, or if reversed, are compensated: ■ Require risk mitigation measures ■ Require long-term monitoring and reporting ■ Require mechanisms to compensate for reversals (e.g., withholding credits in buffer pools)
Additionality	Ensure that emissions reductions and removals are "real" and would not have happened anyway: ■ Require crediting reference levels to be established in ways that avoid "cherry-picking" reference periods and inflated baselines ■ Use jurisdictional-scale historical emissions, conservatively adjusted in the case of high forest, low deforestation countries
Accuracy of measurement	Ensure that reporting on emissions reductions and removals is accurate: ■ Utilize data and methods consistent with Intergovernmental Panel on Climate Change guidance ■ Take advantage of new monitoring technologies and use conservative approaches
Uncertainty	Ensure that the risk of measurement errors is reduced: ■ Discount crediting to reflect the assessed uncertainty in the monitoring data and calculation methods
Social safeguards	Ensure that programs do not harm affected communities and that benefits are equitably shared: ■ Independently verify implementation of a national safeguard system
Double counting	Ensure that each credit for emissions reductions is claimed only once: ■ Certified emissions reductions are unique and maintained on a registry ■ Internationally transferred post-2020 credits are reflected in corresponding adjustments to the nationally determined contribution in host countries' reporting to the United Nations Framework Convention on Climate Change

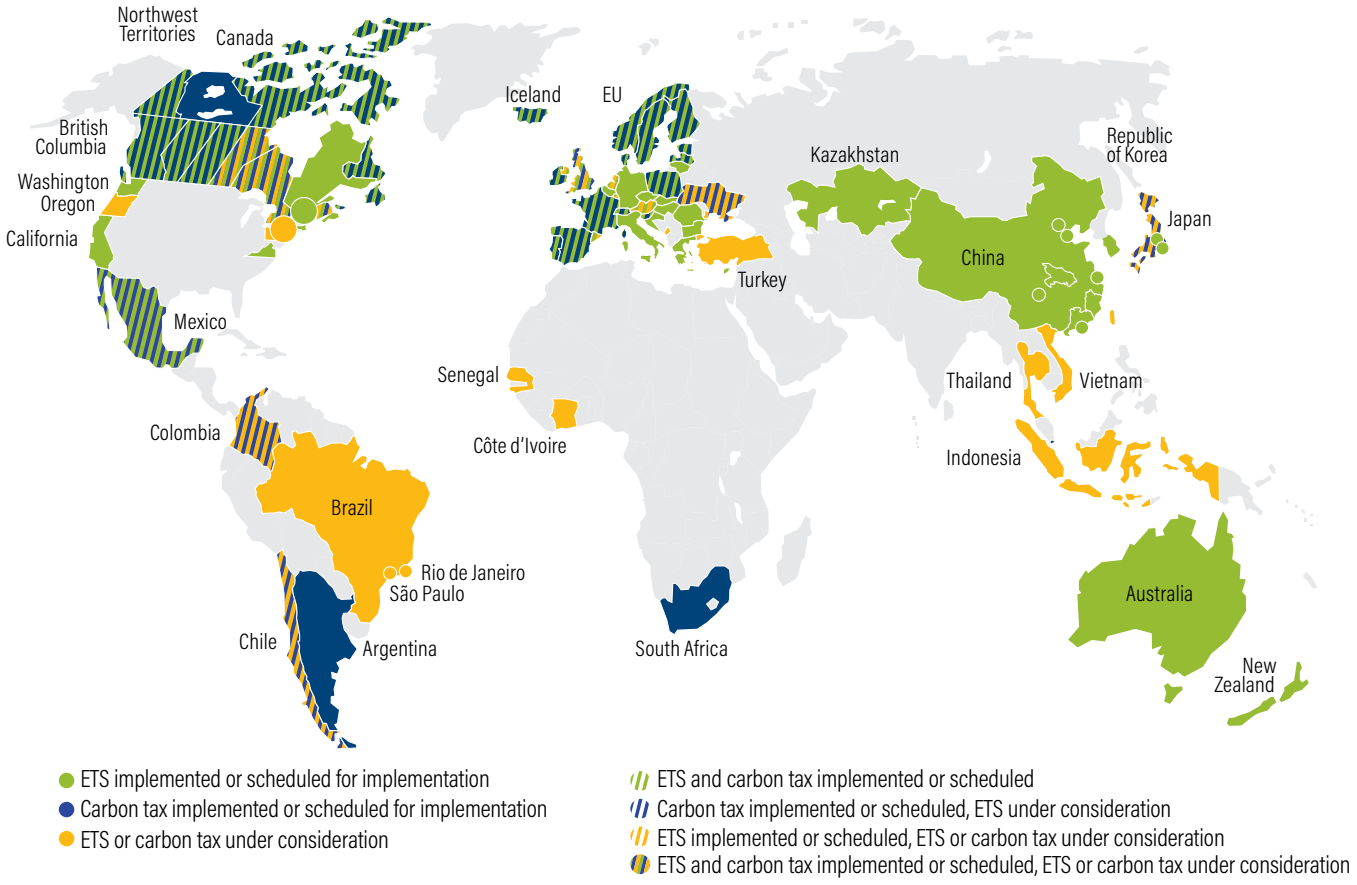
Notes: NBS = nature-based solutions.
Source: WRI authors.

8. WHAT IS THE CURRENT STATE OF DISCUSSIONS ON THE USE OF NBS AS OFFSETS?

To date, investments in NBS have been low and have come primarily from the public sector. However, if NBS credits for emissions reductions and removals were to be included in compliance markets, they could generate hundreds of billions of dollars annually from the private sector (Vivid Economics 2020). However, few compliance regimes currently allow NBS as offsets. California's Cap-and-Trade Program allows for a capped percentage of domestic NBS offsets to count against compliance obligations, and officials are considering the use of international NBS offsets using the Tropical Forest Standard. ICAO recently approved the eligibility of jurisdictional-scale REDD+ credits from two programs as fulfilling the Emissions Unit Eligibility Criteria under CORSIA. Within the UNFCCC, there are ongoing discussions about implementing Article 6 of the Paris Agreement, which will provide a framework for cooperative approaches to achieving climate goals, including the use of internationally transferable mitigation outcomes (Kizzier et al. 2019).

Numerous national compliance markets and carbon pricing schemes exist or are under development. As of 2019, there were 31 emissions trading systems and 30 carbon taxes covering about 22 percent of global GHG emissions (World Bank 2020). Additionally, 96 countries, representing 55 percent of global GHG emissions, have stated that they are planning or considering the use of carbon pricing as a tool to meet their Paris Agreement commitments through their nationally determined contributions (NDCs) (see Figure 4). Several national programs include NBS offsets as a way of achieving their climate goals. Box 4 describes how Colombia has integrated NBS incentives into national carbon trading and tax policies.

Figure 4 | **Emissions Trading Systems and Carbon Taxes in 2019**



Note: ETS = emissions trading system. Large circles represent cooperation initiatives on carbon pricing between subnational jurisdictions. Small circles represent carbon pricing initiatives in cities.
Source: World Bank 2020.

Box 4 | Colombia Allows Finance of Mitigation Projects to Offset Carbon Taxes

In July 2018, Colombia passed a climate bill that established a domestic emissions trading scheme and imposed a US$5 tax on every ton of carbon dioxide emitted by companies. The revenues from the carbon tax are intended to provide a stable source of financing for environmental protection activities through the Sustainable Colombia Fund. Colombia has also created incentives for companies to engage in carbon offsetting activities by allowing the tax obligation to be met through offsets.[a] One concern is that if offsets are available at less than $5 per ton of carbon dioxide, the tax incentive to abate emissions is relaxed. An additional challenge is posed by the need to align project-scale accounting under the domestic scheme with the jurisdictional-scale accounting necessary for environmental integrity and participation in international REDD+ (reducing emissions from deforestation and forest degradation) transactions.

Note: a. Monge 2018.

Most offset-related transactions remain in the realm of voluntary carbon markets. The cumulative market for voluntary offsets topped 1.3 billion tons, exceeding $5.5 billion in 2019, with the volume of voluntary offsets reaching its highest level since 2010. Renewable energy projects had the highest volume transacted in 2019, but forestry and land-use projects were priced three times higher, resulting in $159 million in transactions compared to $60 million for renewable energy (Ecosystem Marketplace 2020).

The standards and norms applied to voluntary claims based on the use of offsets will likely influence the rules governing their role in fulfilling future compliance obligations, and many questions related to this transition remain unanswered. For example, certification standards for voluntary project-scale credits do not currently require assurances of corresponding adjustments in NDC accounting, raising the risk of double counting if credits were to be transferred internationally and counted in another country's inventory. A related concern is that companies could push for acceptance of voluntary credits in compliance systems in ways that undermine the ambition of compliance regimes.

A key outstanding issue on the supply side is how jurisdictional-scale crediting for NBS emissions reductions and removals for international transactions (described in Box 5) can provide incentives for project-scale investment

Box 5 | Jurisdictional Approaches to REDD+ Can Help Alleviate Key Concerns

The REDD+ (reducing emissions from deforestation and forest degradation) framework negotiated under the United Nations Framework Convention on Climate Change defines the implementation, finance, and accounting for forest-related emissions reductions and removals as taking place at the level of national and subnational jurisdictions (such as states and provinces). However, although a few countries and subnational jurisdictions have been rewarded for forest-based emissions reductions by bilateral and multilateral donor agencies, transactions for nature-based solutions in voluntary carbon markets have to date been entirely composed of project-scale credits. A key unresolved issue is how to integrate REDD+ projects into the jurisdictional-scale crediting for international transactions.

Although many REDD+ projects have been effective in promoting local forest protection and improved livelihoods, they often have been characterized by inflated baselines that overstate emissions reductions achieved.[a] Problematic projects have led activists to denounce REDD+ as an ineffective strategy for reducing emissions from deforestation that also risks harming indigenous and local communities. Such opposition has kept international REDD+ credits out of compliance regimes entirely, as in the case of California's Cap-and-Trade Program.[b]

The degree to which project-scale interventions can effectively address the underlying policy and institutional failures that drive deforestation is questionable. Actions needed to halt and reverse deforestation usually require governments to act, such as through enhanced law enforcement or recognition of indigenous territorial rights. A jurisdictional approach to crediting helps concentrate incentives at the appropriate level of authority. The jurisdictional approach can also alleviate some of the supply-side risks, including nonadditionality, leakage, and reversals.

Companies can incentivize near-term government action by communicating a clear demand signal for high-quality, jurisdictional-scale REDD+ credits.

Notes: a. See, for example, West et al. 2020; b. Leuders et al. 2014.
Source: Seymour 2020b.

and performance. Countries will need to "nest" existing projects and associated baselines into jurisdictional-scale accounting at national and subnational levels (Lee et al. 2018).

Key takeaway: Many key questions regarding NBS credits in the transition from voluntary to compliance markets remain unresolved.

In addition to ongoing initiatives such as the SBTi described above, numerous groups have formed to guide corporate net-zero commitments and participation in carbon markets. Four such initiatives are highlighted in Table 5.

Key takeaway: Many initiatives and processes are now under way to help guide companies regarding climate mitigation strategies in general and the use of NBS as offsets in particular.

Table 5 | **Initiatives Providing Guidance Related to Corporate Participation in Carbon Markets**

	ABOUT	NBS FOCUS	OUTLOOK
Natural Climate Solutions Alliance	The alliance aims to scale up affordable natural climate mitigation solutions and is led by the World Economic Forum and the World Business Council for Sustainable Development.	The alliance is focused on NBS, with three working groups developing guidance for supply-side, demand-side, and market integrity.	Publication of its draft guidance is expected in early 2021.
Race to Zero	The Race to Zero campaign aims to bring together net-zero commitments from cities, businesses, and investors in the run up to the 26th Conference of the Parties (COP26).	The campaign is not focused on NBS but does include guidance on the use of offsetting to achieve net zero.	The objective is to build momentum around the shift to a decarbonized economy ahead of COP26 (November 2021) by signaling that businesses, cities, regions, and investors are united in meeting the Paris Agreement goals.
Taskforce on Scaling Voluntary Carbon Markets	The taskforce is a private sector–led initiative working to scale a voluntary carbon market to help meet the goals of the Paris Agreement.	The taskforce is not specific to NBS, but the large portion of NBS credits currently traded on the voluntary market signify that they will play a critical role.	The taskforce's final report was published in January 2021.
Mobilizing Voluntary Carbon Markets	The Environmental Defense Fund, in partnership with the High Tide Foundation and ENGIE Impact, organized a dialogue series to provide recommendations for mobilizing voluntary carbon markets to drive climate action.	The partnership is not specific to NBS but focuses on designing credible voluntary markets.	Its recommendations were published in December 2020.

Note: NBS = nature-based solutions.
Sources: EDF 2020a; IIF 2020; NCS Alliance n.d.; UNFCCC n.d.

9. WHAT CAN COMPANIES DO NOW?

The use of NBS as offsets offers a near-term, time-limited option for companies to counterbalance current emissions while continuing to invest in their own decarbonization strategies and develop new low-carbon technologies. Instead of falling short on their emissions reduction targets, corporate investment in near-term compensation and long-term neutralization could accelerate progress towards the societal goal of net zero.

For such compensation and neutralization to be successful, the risks must be addressed and appropriately managed to ensure both the environmental and social integrity of NBS credits. This paper has laid out some of the key considerations on both the demand side, to ensure ambitious corporate climate strategies, and on the supply-side, to ensure that emissions reductions and removals are real and do no harm. Although voluntary carbon markets have developed standards and norms for purchasing project-scale NBS offsets, efforts to adapt the current practices to a new generation of claims aligned with the Paris Agreement (including jurisdictional-scale crediting for REDD+), the transition to net zero, and the use of offsets in compliance markets are still in progress.

In the meantime, companies seeking to employ NBS offsets need to promote rules that ensure a high level of integrity; if not, the credibility and legitimacy of NBS offsets risk being tarnished. The San Jose Principles for High Ambition and Integrity in International Carbon Markets can act as a reference point for corporate actors interested in advocating for the establishment of robust carbon markets (Ortiz 2019).

Despite the current uncertainty, there are actions that companies can take now as they consider including NBS as offsets as part of their corporate mitigation strategies. Table 6 illustrates the types of "no regrets" actions companies can take as well as actions companies should approach with caution.

Combating climate change requires immediate decarbonization actions across all sectors. By combining aggressive abatement targets with investments in NBS, companies can be part of a "both/and" approach to climate action. Expectations of corporate ambition to align with society's transition to net zero are evolving rapidly, and they will no doubt accelerate during the run-up to the 26th Conference of the Parties in late 2021, when negotiations on Article 6 are expected to conclude and countries will submit their enhanced NDCs. In the meantime, companies can contribute by implementing ambitious strategies for abating their own emissions, signaling demand for high-quality NBS emissions reductions, and advocating for robust standards and norms to govern voluntary and compliance-based transactions in NBS offsets.

> **Key takeaway:** In addition to implementing aggressive abatement strategies, companies can signal demand for high-quality NBS credits and advocate for robust standards and norms to govern carbon markets.

Table 6 | **Examples of How Companies Should Approach NBS Strategies**

LEVEL OF RISK	ILLUSTRATIVE ACTIONS	ASSOCIATED RISKS
"No regrets" NBS strategies companies can take now with limited or no associated risk	Where companies own or control land or can influence suppliers who do, incorporate NBS strategies within value chains and enhance monitoring systems to track progress in reducing land sector emissions and enhancing land sector removals	
	Invest in high-quality NBS credits without making claims (e.g., to climate neutrality)	
	Participate in ongoing processes to develop guidance and norms	
	Advocate for robust compliance markets that include high-quality NBS offsetting mechanisms consistent with the San Jose Principles	
	Provide a demand signal by publishing commitments to purchase high-quality jurisdictional-scale NBS credits at a price attractive to supplier jurisdictions	
	Include in mitigation strategies (and make claims based on) NBS investment and purchases of high-quality NBS credits above and beyond their own decarbonization in line with science-based targets	
NBS strategies involving risks to social and environmental integrity and associated reputational risk	Invest in NBS (and make claims based on that investment) without a credible decarbonization target and strategy	■ Vulnerable to accusations of using NBS to "greenwash" their own lack of action on decarbonization ■ Risk of losing access to markets and finance due to delays in transitioning the business model to be consistent with a low-carbon economy
	Include in mitigation strategies (and make claims based on) NBS investments and purchases to compensate for some portion of emissions not being reduced at a rate aligned with the goals of the Paris Agreement	■ Reputational risk that the use of NBS will be seen as substituting for their own decarbonization efforts ■ Risk that investments and purchases cannot be used to make net-zero claims
	Invest in or purchase NBS emissions reductions or removals that are of questionable quality	■ Reputational risk of being associated with harm to local people or ecosystems, and/or ineffective climate action ■ Risk that credits will not be accepted in future compliance regimes
	Make claims that could mislead customers to increase their emissions-producing consumption	■ Risk that the use of NBS will delay behavioral changes needed for society's transition to a low-carbon economy
	Exclude high-priority NBS from portfolios (e.g., invest only in removals, when investment in reducing emissions remains urgent)	■ Risk of missing opportunities for higher climate impact and associated cobenefits

Note: NBS = nature-based solutions.
Source: WRI authors.

APPENDIX A

Table A1 | **Companies Are Integrating NBS into Their Mitigation Strategies**

	SHELL	MICROSOFT	NESTLÉ
Sector	Oil and Gas	Technology	Food and Beverage
Overarching target	Net-zero emissions in energy business by 2050 or sooner	Carbon negative by 2030; removal of all carbon emissions since Microsoft was founded (in 1975) by 2050	Net-zero emissions by 2050
Scope 1 and 2 emissions	Net-zero target on all emissions from the manufacturing of products by 2050 at latest (accounts for less than 15% of emissions)	Drive down scope 1 and 2 emissions to near zero by 2025	By 2020, reduce scope 1 and 2 emissions per ton of product to achieve 35% reduction using 2010 baseline (reached 34% reduction as of 2019)
Scope 3 emissions	Reduction in the net carbon footprint of energy products sold by 30% by 2035 and around 65% by 2050	Reduce scope 3 emissions by more than half by 2030	Accounts for 90% of emissions, so a significant reduction in scope 3 is needed to achieve net-zero target
Use of offsets	Shell will make use of offsets to achieve net-zero target	Microsoft will use a portfolio of negative-emission technologies including afforestation, reforestation, soil carbon sequestration, BECCS, and DAC	Nestlé plans on offsetting emissions it cannot eliminate; its water portfolio is to be carbon neutral by 2025 using high-quality offsets
How NBS are integrated into offsetting strategies	Intends to invest in projects that use nature to reduce carbon dioxide; examples include reforestation projects and buying and selling NBS carbon credits for consumer "carbon neutral" fuel purchases	Microsoft's carbon removal portfolio will initially focus on NBS to help the company offset its emissions, with the goal of shifting to technology-based solutions when they become more viable	Nestlé is scaling up "insetting" initiatives (including planting 3 million trees through Project RELeaf in Malaysia) to complement efforts to stop deforestation within its supply chain

Note: BECCS = bioenergy with carbon capture and storage; DAC = direct air capture; NBS = nature-based solutions. World Resources Institute has not evaluated the credibility of these targets and strategies and therefore cannot attest to their scientific rigor; all materials are sourced directly from publicly available corporate strategies.
Sources: Nestlé 2019, 2020; Shell n.d.; Smith 2020.

APPENDIX B

Table B1 | **Concerns Related to the Use of Offsets in Voluntary and Compliance Regimes**

TYPE OF CONCERN	ISSUE	RISK TO ADDRESS	NON-NBS EXAMPLE	NBS EXAMPLE
Demand-side environmental integrity	Flooding the market	Availability of a large volume of low-cost offsets could relieve pressure on companies to achieve higher-cost emissions reductions to meet compliance targets	Risk is independent of offset supply source (e.g., renewable energy, forestry and land use, waste disposal, etc.)	
	Greenwashing	Marketing of "carbon neutral" products based on voluntary offsets could relieve public pressure on companies to reduce emissions and induce consumers to increase consumption of emissions-intensive products	Risk is independent of offset supply source	
Demand-side social integrity	Harm to local communities	Offsetting in compliance regimes could allow continued emissions of pollutants that impair the health of surrounding communities	Risk is independent of offset supply source	
Supply-side Environmental Integrity	Measurement/ uncertainty	Measurement errors could overestimate reduced emissions	The challenge of estimating GHG emissions displaced on an electricity grid powered by solar	Incomplete data on the impacts of improved forest management on carbon sequestration
	Leakage	Activities that generate emissions in one area could be displaced to another area	Higher emission standards in one jurisdiction shift production facilities with high emissions to another jurisdiction	Law enforcement efforts shift illegal logging activity or agricultural expansion to another jurisdiction
	Permanence	Credited emissions reductions/removals could be reversed	Mismanaged geological storage of carbon dioxide could leak	If forests are protected or restored today, mismanagement or changes in policy could cause them to be destroyed tomorrow
	Additionality	Credits could be issued for emissions reductions/removals that would have happened anyway	Renewable energy technologies are increasingly cost-competitive with fossil fuels without revenue from offsets	If deforestation would have declined anyway, payments might not result in additional emissions reductions
	Harm to local ecosystems	Land use prioritizing emissions reductions/ removals could adversely affect biodiversity or ecosystem services	Solar panel arrays could displace desert plants and animals	Plantations of fast-growing trees could displace biodiverse grasslands
Supply-side social integrity	Harm to local communities	Land use prioritizing emissions reductions/ removals could adversely affect local rights and livelihoods	Filling of hydroelectric reservoirs could displace local communities	Forest protection and restoration efforts could restrict customary access to forest resources or displace food production

Note: GHG = greenhouse gas; NBS = nature-based solutions.
Source: Adapted from Seymour and Busch 2016.

ENDNOTES

1. This paper focuses on land-based NBS, including mangroves and wetlands. Ocean-based NBS, such as seagrass or seaweed aquaculture, are important climate solutions but are not within the scope of this paper. The terms *nature-based solutions* (NBS) and *natural climate solutions* (NCS) are often used interchangeably, but whereas NBS tend to refer to a broad suite of activities contributing to climate adaptation as well as mitigation, NCS are often focused more narrowly on reduction or removal of carbon emissions (Seddon et al. 2020). We will use the broader NBS terminology throughout the paper in order to maintain attention to the multiplicity of benefits provided by nature.

2. In this paper, we use *credit* to describe the verified emissions reductions or removals generated, traded, and retired and *offset* to describe the use of financed climate mitigation actions to compensate for or neutralize a company's own emissions.

3. The IPCC defines *net zero* as the point at which "anthropogenic emissions of greenhouse gases to the atmosphere are balanced by anthropogenic removals over a specific time period," acknowledging that achieving net zero will require carbon removal (IPCC 2018). Carbon removal can be achieved through industrial technologies such as bioenergy carbon capture and storage or direct air capture or through nature-based solutions such as forest or peatland restoration.

4. Corresponding adjustments are also required for credits used by airlines to fulfill compliance obligations under the International Civil Aviation Organization's Carbon Offsetting and Reduction Scheme for International Aviation.

5. For more information, please see ICAO n.d.

6. Many would also include agriculture in light of methane emissions from livestock and nitrogen dioxide emissions from fertilizer.

7. For more information about the Carbon Fund, see https://www.forestcarbonpartnership.org/carbon-fund.

8. To learn more about the Architecture for REDD+ Transactions and The REDD+ Environmental Excellence Standard, please see https://www.artredd.org/.

GLOSSARY OF TERMS AND KEY ACRONYMS

abatement: Measures that prevent the release of GHGs into the atmosphere by reducing or eliminating sources of emissions associated with the operations of a company and its value chain.

additionality: The idea that emissions reductions and removals should produce additional abatement compared with a reference scenario of emissions reductions that would have occurred in the absence of the market-based mechanism (Levin et al. 2019).

afforestation: The conversion to forest of land that historically (at least 50 years) has not contained forests (IPCC 2019).

bioenergy with carbon capture and storage (BECCS): This is the process of using biomass for energy, capturing the associated carbon emissions before they are released into the atmosphere, and storing the captured carbon underground or in long-lived products (Mulligan et al. 2020).

carbon credit: An emissions unit that is issued by a carbon crediting program and represents an emissions reduction or removal of GHGs; carbon credits are uniquely serialized, issued, tracked, and canceled by means of an electronic registry (WWF-US et al. 2020).

Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA): Developed by ICAO (see below), CORSIA is a compliance regime for the global international airline industry, which is not covered by national emissions accounting under the UNFCCC.

climate positive: An approach in which companies contribute to the broader social and environmental agenda while ensuring the integrity of their own climate strategy (SBTi 2020a).

compensation: Measurable climate mitigation outcomes resulting from actions outside of a company's value chain that compensate for emissions that remain unabated within the value chain (Ekstrom et al. 2015).

direct air capture: The process of chemically removing CO_2 from the air and subsequently storing it underground or in long-lived products (Mulligan et al. 2020).

double counting: An instance in which the same mitigation outcome is counted more than once within or across compliance regimes.

greenhouse gas (GHG): A gas that absorbs and reemits infrared radiation, thereby trapping it in Earth's atmosphere; GHGs include CO_2, methane, water vapor, nitrous oxide, and ozone.

Greenhouse Gas (GHG) Protocol: Provides standards, guidance, tools, and training for businesses and governments to measure and manage climate-warming emissions.

International Civil Aviation Organization (ICAO): This is a specialized agency within the United Nations that manages the administration and governance of international air travel.

IPCC Special Report, *Climate Change and Land*: A special report on climate change, desertification, land degradation, sustainable land management, food security, and GHG fluxes in terrestrial ecosystems (IPCC 2019).

IPCC Special Report, *Global Warming of 1.5°C*: This Special Report discusses the impacts of global warming of 1.5°C above preindustrial levels and related global GHG emissions pathways in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty (IPCC 2018).

leakage: Leakage occurs when an accounted activity that causes emissions (such as deforestation or land degradation) is displaced to another location outside of the accounting system without emissions being reduced globally.

nationally determined contribution (NDC): Nationally Determined Contributions embody efforts by each country to reduce national emissions and adapt to the impacts of climate change. The Paris Agreement requires each Party to prepare, communicate, and maintain successive NDCs that it intends to achieve.

nature-based solutions (NBS): Actions to protect, sustainably manage, and restore natural or modified ecosystems that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits (IUCN n.d.).

net zero: The IPCC defines this as the point when anthropogenic GHG emissions to the atmosphere are balanced by removals over a specific period.

neutralization: The removal and permanent storage of atmospheric carbon that can neutralize the effect of releasing GHGs into the atmosphere (SBTi 2020a).

permanence: The idea that credited emissions reductions and removals should be long-lasting, with the risk of reversals managed with long-term monitoring and compensation from buffer pools if reversals take place.

REDD+: Reducing emissions from deforestation and forest degradation and the role of conservation, sustainable management of forests, and enhancement of forest carbon stocks in developing countries. The climate mitigation strategy based on results-based payments first entered negotiations under the UNFCCC in 2007 and was finalized in 2013.

reforestation: The conversion to forest of land that has previously contained forests but that has been converted to some other use (IPCC 2019).

residual emissions: GHG emissions that remain unabated on a Paris-aligned net-zero pathway, and are thus eligible for compensation or neutralization in a climate positive approach.

science-based target: A target that is in line with what the latest climate science says is necessary to meet the goals of the Paris Agreement—to limit global warming to well-below 2°C above preindustrial levels and pursue efforts to limit warming to 1.5°C.

Sustainable Development Goals (SDGs): The 17 global goals for development for all countries established by the United Nations (UN n.d.).

United Nations Framework Convention on Climate Change (UNFCCC): An international treaty that seeks to reduce atmospheric concentrations of GHGs.

value chain emissions: A company's scope 1, 2, and 3 emissions as defined by the GHG Protocol accounting standard.

REFERENCES

Anderegg, W., A. Trugman, G. Badgley, C. Anderson, A. Bartuska, P. Ciais, D. Cullenward, et al. 2020. "Climate-Driven Risks to the Climate Mitigation Potential of Forests." *Science* 368 (6497). https://doi:10.1126/science.aaz7005.

Angelsen, A., P. Jagger, R. Babigumira, B. Belcher, N. Hogarth, S. Bauch, J. Borner, C. Smith-Hall., and S. Wunder. 2014. "Environmental Income and Rural Livelihoods: A Global-Comparative Analysis." *World Development* 64 (1): S12–S28. https://doi.org/10.1016/j.worlddev.2014.03.006.

Broekhoff, D., M. Gillenwater, T. Colbert-Sangree, and P. Cage. 2019. *Securing Climate Benefit: A Guide to Using Carbon Offsets*. Stockholm: Stockholm Environment Institute; Washington, DC: Greenhouse Gas Management Institute. https://www.offsetguide.org/pdf-download/.

Climate Focus. 2017. *Progress on the New York Declaration on Forests: Finance for Forests—Goals 8 and 9 Assessment Report*. Prepared by Climate Focus in cooperation with the New York Declaration on Forest Assessment Partners with support from the Climate and Land Use Alliance. Amsterdam: Climate Focus. https://climatefocus.com/sites/default/files/NYDF%20report%20 2017%20FINAL.pdf.

Cook, J., and R. Taylor. 2020. "WRI Commentary: Nature Is an Economic Winner for COVID-19 Recovery." World Resources Institute, July 6. https://www.wri.org/news/coronavirus-nature-based-solutions-economic-recovery.

Di Marco, M., J. Watson, D. Currie, H. Possingham, and O. Venter. 2018. "The Extent and Predictability of the Biodiversity-Carbon Correlation." *Ecology Letters* 21 (3). https://doi.org/10.1111/ele.12903.

Donato, D.C., J.B. Kauffman, D. Murdiyarso, S. Kurnianto, M. Stidham, and M. Kanninen. 2011. "Mangroves among the Most Carbon-Rich Forests in the Tropics." *Nature Geoscience* 4 (5): 293–97. https://doi.org/10.1038/ngeo1123.

Ecosystem Marketplace. 2020. *Financing Emission Reductions for the Future: State of Voluntary Carbon Markets 2019*. Washington, DC: Forest Trends.

EDF (Environmental Defense Fund). 2019. "The AAA Framework for Climate Policy Leadership." https://business.edf.org/insights/aaa-leadership-framework/.

EDF. 2020a. *Mobilizing Voluntary Carbon Markets to Drive Climate Action: Recommendations*. New York: EDF. https://www.edf.org/sites/default/files/documents/Mobilizing_Voluntary_Carbon_Markets_to_Drive_CClimat_Action_Recommendations.pdf.

EDF. 2020b. *Pathways to Net Zero: A Guide for Business*. New York: EDF. https://business.edf.org/files/Pathways-to-Net-ZeroFINAL-1.pdf.

Ekstrom, J., L. Bennun, and R. Mitchell. 2015. *A Cross-Sector Guide for Implementing the Mitigation Hierarchy*. London: Cross Sector Biodiversity Initiative of the IPIECA, the International Council on Mining and Metals, and Equator Principles. http://www.csbi.org.uk/wp-content/uploads/2017/10/CSBI-Mitigation-Hierarchy-Guide.pdf.

Espejo, A., M. Becerra-Leal, and N. Aguilar-Amuchastegui. 2020. "Comparing the Environmental Integrity of Emission Reductions from REDD Programs with Renewable Energy Projects." *Forests* 11 (12): 1360. https://doi.org/10.3390/f11121360.

ETC (Energy Transitions Commission). 2018. *Mission Possible: Reaching Net-Zero Carbon Emissions from Harder-to-Abate Sectors by Mid-Century*. London: ETC. https://www.ineteconomics.org/uploads/general/ETC_MissionPossible_FullReport.pdf.

Global Commission on Adaptation. 2019. *Adapt Now: A Global Call for Leadership on Climate Resilience*. Rotterdam, Netherlands: Global Center on Adaptation; Washington, DC: World Resources Institute. https://cdn.gca.org/assets/2019-09/GlobalCommission_Report_FINAL.pdf.

Gold Standard. n.d. "Vision and Impacts." https://www.goldstandard.org/about-us/vision-and-mission. Accessed October 1, 2020.

Goldstein, A., W.R. Turner, S.A. Spawn, K.J. Anderson-Teixeira, S. Cook-Patton, J. Fargione, H.K. Gibbs, et al. 2020. "Protecting Irrecoverable Carbon in Earth's Ecosystems." *Nature Climate Change* 10 (April): 287–95. https://doi.org/10.1038/s41558-020-0738-8.

Griscom, B.W., J. Adams, P.W. Ellis, R.A. Houghton, G. Lomax, D.A. Miteva, W.H. Schlesinger, et al. 2017. "Natural Climate Solutions." *Proceedings of the National Academy of Sciences* 114 (44): 11645–50. https://doi.org/10.1073/pnas.1710465114.

Henderson, K., D. Pinner, M. Rogers, B. Smeets, C. Tryggestad, and D. Vargas. 2020. "Climate Math: What a 1.5-Degree Pathway Would Take." *McKinsey Quarterly* 2 (June). https://www.mckinsey.com/business-functions/sustainability/our-insights/climate-math-what-a-1-point-5-degree-pathway-would-take.

ICAO (International Civil Aviation Organization). n.d. "Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA)." https://www.icao.int/environmental-protection/CORSIA/Pages/default.aspx. Accessed January 10, 2021.

IIF (Institute of International Finance). 2020. "Taskforce on Scaling Voluntary Carbon Markets." https://www.iif.com/tsvcm.

IPBES (Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services Report). 2019. *Global Assessment Report on Biodiversity and Ecosystem Services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services*, edited by E.S. Brondizio, J. Settele, S. Díaz, and H.T. Ngo. Bonn, Germany: IPBES.

IPCC (Intergovernmental Panel on Climate Change). 2018. *Global Warming of 1.5°C. An IPCC Special Report on the Impacts of Global Warming of 1.5°C above Preindustrial Levels and Related Global Greenhouse Gas Emission Pathways, in the Context of Strengthening the Global Response to the Threat of Climate Change, Sustainable Development, and Efforts to Eradicate Poverty*, edited by V. Masson-Delmotte, P. Zhai, H.O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, et al. Geneva: IPCC. https://www.ipcc.ch/site/assets/uploads/sites/2/2019/06/SR15_Full_Report_Low_Res.pdf.

IPCC. 2019. *Climate Change and Land: An IPCC Special Report on Climate Change, Desertification, Land Degradation, Sustainable Land Management, Food Security, and Greenhouse Gas Fluxes in Terrestrial Ecosystems*, edited by P.R. Shukla, J. Skea, E. Calvo Buendia, V. Masson-Delmotte, H.-O. Pörtner, D.C. Roberts, P. Zhai, et al. Geneva: IPCC. https://www.ipcc.ch/report/srccl/.

IUCN (International Union for Conservation of Nature). n.d. "IUCN Global Standard for Nature-Based Solutions." https://www.iucn.org/theme/ecosystem-management/our-work/iucn-global-standard-nature-based-solutions. Accessed January 10, 2021.

Kizzier, K., K. Levin, and M. Rambharos. 2019. "What You Need to Know about Article 6 of the Paris Agreement." *Insights* (blog), December 2. https://www.wri.org/blog/2019/12/article-6-paris-agreement-what-you-need-to-know.

Lawrence, D., and K. Vandecar. 2015. "Effects of Tropical Deforestation on Climate and Agriculture." *Nature Climate Change* 5 (January): 27–36. https://doi.org/10.1038/nclimate2430.

Lee, D., P. Llopis, R. Waterworth, G. Roberts, and T. Pearson. 2018. "Approaches to REDD+ Nesting: Lessons Learned from Country Experiences." Working Paper. Washington, DC: World Bank. http://documents1.worldbank.org/curated/en/670171523647847532/pdf/Main-report.pdf.

Leuders, J., C. Horowitz, A. Carlson, S. Hecht, and E. Parson. 2014. "The California REDD+ Experience: The Ongoing Political History of California's Initiative to Include Jurisdictional REDD+ Offsets within Its Cap-and-Trade System." Working Paper 386. Washington, DC: Center for Global Development. https://www.cgdev.org/sites/default/files/CGD-Climate-Forest-Paper-Series-13-Lueders-Horowitz-et-al-California-REDD.pdf.

Levin, K., K. Kizzier, and M. Rambharos. 2019. "Making Sense of Article 6: Key Issues and What's at Stake." Working Paper. Washington, DC: World Resources Institute. https://files.wri.org/s3fs-public/making-sense-article-6.pdf.

Monge, C. 2018. "Colombia Puts a Tax on Carbon." Conservation Finance Network, November 27. https://conservationfinancenetwork.org/2018/11/27/colombia-puts-tax-on-carbon.

Mulligan, J., A. Rudee, K. Lebling, K. Levin, J. Anderson, and B. Christensen. 2020. "CarbonShot: Federal Policy Options for Carbon Removal in the United States." Working Paper. Washington, DC: World Resources Institute. https://files.wri.org/s3fs-public/carbonshot-federal-policy-options-for-carbon-removal-in-the-united-states_1.pdf.

NCS (Natural Climate Solutions) Alliance. n.d. "Natural Climate Solutions: Practical, Cost-Effective Climate Action." https://www.weforum.org/natural-climate-solutions-alliance. Accessed January 10, 2021.

Nestlé. 2019. "Nestlé Accelerates Action to Tackle Climate Change and Commits to Zero Net Emissions by 2050." Press release, September 12. https://www.nestle.com/media/pressreleases/allpressreleases/nestle-climate-change-commitment-zero-net-emissions-2050.

Nestlé. 2020. "Nestlé to Plant 3 Million Trees by 2023 in Malaysia." Press release, September 21. https://www.nestle.com.my/media/pressreleases/nestle-to-plant-trees.

NYDF Assessment Partners. 2019. *Protecting and Restoring Forests: A Story of Large Commitments yet Limited Progress*. New York Declaration on Forests Five-Year Assessment Report. Amsterdam: Climate Focus. https://forestdeclaration.org/images/uploads/resource/2019NYDFReport.pdf.

Ortiz, D.A. 2019. "Press Release: 32 Leading Countries Set Benchmark for Carbon Markets with San Jose Principles." Direccion de Cambio Climatico, December 14. https://cambioclimatico.go.cr/press-release-leading-countries-set-benchmark-for-carbon-markets-with-san-jose-principles/.

Pan, Y., R. Birdsey, J. Fang, R. Houghton, P. Kauppi, W. Kurz, O. Phillips, et al. 2011. "A Large and Persistent Carbon Sink in the World's Forests." *Science* 333 (6045): 988–93. https://doi.org/10.1126/science.1201609.

Roe, S., C. Streck, M. Obersteiner, S. Frank, B. Griscom, L. Drouet, O. Fricko, et al. 2019. "Contribution of the Land Sector to a 1.5 °C World." *Nature Climate Change* 9 (November): 817–28. https://doi.org/10.1038/s41558-019-0591-9.

Salmond, J.A., M. Tadaki, S. Vardoulakis, K. Arbuthnott, A. Coutts, M. Demuzere, K.N. Dirks, et al. 2016. "Health and Climate-Related Ecosystem Services Provided by Street Trees in the Urban Environment." *Environmental Health* 15 (S36). https://doi.org/10.1186/s12940-016-0103-6.

SBTi (Science-Based Targets initiative). 2019. *Raising the Bar: Exploring the Science-Based Targets Initiative's Progress in Driving Ambitious Climate Action*. https://sciencebasedtargets.org/wp-content/uploads/2019/12/SBTi-Progress-Report-2019-FINAL-v1.2.pdf.

SBTi. 2020a. *Foundations for Science-Based Net-Zero Target Setting in the Corporate Sector*. https://sciencebasedtargets.org/resources/legacy/2020/09/foundations-for-net-zero-full-paper.pdf.

SBTi. 2020b. *Science-Based Target Setting Manual.* Version 4.1. https://sciencebasedtargets.org/resources/legacy/2017/04/SBTi-manual.pdf.

Searchinger, T., R. Waite, C. Hanson, and J. Ranganathan. 2019. *Creating a Sustainable Food Future: A Menu of Solutions to Feed Nearly 10 Billion People by 2050*. Washington, DC: World Resources Institute. https://research.wri.org/sites/default/files/2019-07/WRR_Food_Full_Report_0.pdf.

Searchinger, T., and J. Ranganathan. 2020. "Insider: Further Explanation on the Potential Contribution of Soil Carbon Sequestration on Working Agricultural Lands to Climate Change Mitigation." *Insights* (blog), August 24. https://www.wri.org/blog/2020/08/insider-further-explanation-potential-contribution-soil-carbon-sequestration-working.

Seddon, N., A. Chausson, P. Berry, C. Girardin, A. Smith, and T. Beth. 2020. "Understanding the Value and Limits of Nature-Based Solutions to Climate Change and Other Global Challenges." *Philosophical Transactions of the Royal Society B* 375 (January): 20190120. https://doi.org/10.1098/rstb.2019.0120.

Seymour, F. 2020a. "Seeing the Forests as well as the (Trillion) Trees in Corporate Climate Strategies." *One Earth* 2 (5): 390–93. https://doi.org/10.1016/j.oneear.2020.05.006.

Seymour, F. 2020b. "Insider: 4 Reasons Why a Jurisdictional Approach for REDD+ Crediting Is Superior to a Project-Based Approach." *Insights* (blog), May 5. https://www.wri.org/blog/2020/05/insider-4-reasons-why-jurisdictional-approach-redd-crediting-superior-project-based.

Seymour, F., and J. Busch. 2016. *Why Forests? Why Now? The Science, Economics and Politics of Tropical Forests and Climate Change.* Washington, DC: Center for Global Development.

Shell. n.d. "Shell's Ambition to Be a Net-Zero Emissions Energy Business." https://www.shell.com/energy-and-innovation/the-energy-future/shells-ambition-to-be-a-net-zero-emissions-energy-business.html. Accessed January 10, 2021.

Smith, B. 2020. "Microsoft Will Be Carbon Negative by 2030." *Official Microsoft Blog*, January 16. https://blogs.microsoft.com/blog/2020/01/16/microsoft-will-be-carbon-negative-by-2030/.

Stevenson, M., and C. Webb. 2020. "First Things First: Avoid, Reduce . . . and Only after That—Compensate." WWF Discussion Paper: Mitigation Hierarchies. Gland, Switzerland: World Wide Fund for Nature. https://d2ouvy59p0dg6k.cloudfront.net/downloads/wwf_discussion_paper_mitigation_hierarchies_april_2020.pdf.

TCFD (Task Force on Climate-related Financial Disclosures). n.d. "Task Force on Climate-related Financial Disclosures." https://www.fsb-tcfd.org/. Accessed January 18, 2021.

TNFD (Task Force on Nature-related Financial Disclosures). n.d. "Bringing Together a Taskforce on Nature-related Financial Disclosures." https://tnfd.info/. Accessed January 18, 2021.

UN (United Nations). n.d. "The 17 Goals." https://sdgs.un.org/goals. Accessed January 18, 2021.

UNEPFI (United Nations Environment Programme Finance Initiative). n.d. "United Nations–Convened Net-Zero Asset Owner Alliance." https://www.unepfi.org/net-zero-alliance/. Accessed January 15, 2021.

UNFCCC (United Nations Framework Convention on Climate Change). 2015. *Paris Agreement*. Bonn, Germany: UNFCCC. https://unfccc.int/sites/default/files/english_paris_agreement.pdf.

UNFCCC. n.d. "Race to Net Zero Campaign." https://unfccc.int/climate-action/race-to-zero-campaign. Accessed January 10, 2021.

Verra. n.d. "About Verra." https://verra.org/about-verra/what-we-do/. Accessed October 1, 2020.

Vivid Economics. 2020. *The Inevitable Forest Finance Response: Investor Opportunities*. London: Vivid Economics. https://www.vivideconomics.com/wp-content/uploads/2020/10/The-inevitable-forestry-response-1.pdf.

Watson, J., T. Evans, O. Venter, and B. Williams. 2018. "The Exceptional Value of Intact Forest Ecosystems." *Nature Ecology & Evolution* 2 (April): 599–610. https://doi.org/10.1038/s41559-018-0490-x.

West, T., J. Borner, E. Sills, and A. Kontoleon. 2020. "Overstated Carbon Emission Reductions from Voluntary REDD+ Projects in the Brazilian Amazon." *Proceedings of the National Academy of Sciences of the United States of America* 117 (39): 24188–94. https://doi.org/10.1073/pnas.2004334117.

World Bank. 2020. *State and Trends of Carbon Pricing 2020*. Washington, DC: World Bank. https://openknowledge.worldbank.org/handle/10986/33809.

WWF (World Wildlife Fund). 2019. *WWF Position and Guidance on Voluntary Purchases of Carbon Credits*. Washington, DC: World Wildlife Fund. https://c402277.ssl.cf1.rackcdn.com/publications/1310/files/original/WWF_position_and_guidance_on_corporate_use_of_voluntary_carbon_credits_EXTERNAL_VERSION_11_October_2019_v1.2.pdf?1591194127.

WWF-US (World Wildlife Fund), EDF (Environmental Defense Fund), and Oeko-Institut. 2020. *What Makes a High-Quality Carbon Credit? Phase 1 of the "Carbon Credit Guidance for Buyers" Project: Definition of Criteria for Assessing the Quality of Carbon Credits.* Freiburg im Breisgau, Germany: Oeko-Institut. https://www.edf.org/sites/default/files/documents/what_makes_a_high_quality_carbon_credit.pdf.

Zeppetello, L.V., L.A. Parsons, J.T. Spector, R.L. Naylor, D.S. Battisti, Y.J. Masuda, and N.H. Wolff. 2020. "Large Scale Tropical Deforestation Drives Extreme Warming." *Environmental Research Letters* 15 (8): 084012. https://doi.org/10.1088/1748-9326/ab96d2.

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ABOUT WRI

World Resources Institute is a global research organization that turns big ideas into action at the nexus of environment, economic opportunity, and human well-being.

Our Challenge
Natural resources are at the foundation of economic opportunity and human well-being. But today, we are depleting Earth's resources at rates that are not sustainable, endangering economies and people's lives. People depend on clean water, fertile land, healthy forests, and a stable climate. Livable cities and clean energy are essential for a sustainable planet. We must address these urgent, global challenges this decade.

Our Vision
We envision an equitable and prosperous planet driven by the wise management of natural resources. We aspire to create a world where the actions of government, business, and communities combine to eliminate poverty and sustain the natural environment for all people.

Our Approach
COUNT IT
We start with data. We conduct independent research and draw on the latest technology to develop new insights and recommendations. Our rigorous analysis identifies risks, unveils opportunities, and informs smart strategies. We focus our efforts on influential and emerging economies where the future of sustainability will be determined.

CHANGE IT
We use our research to influence government policies, business strategies, and civil society action. We test projects with communities, companies, and government agencies to build a strong evidence base. Then, we work with partners to deliver change on the ground that alleviates poverty and strengthens society. We hold ourselves accountable to ensure our outcomes will be bold and enduring.

SCALE IT
We don't think small. Once tested, we work with partners to adopt and expand our efforts regionally and globally. We engage with decision-makers to carry out our ideas and elevate our impact. We measure success through government and business actions that improve people's lives and sustain a healthy environment.