HIGH-QUALITY BLUE CARBON PRINCIPLES AND GUIDANCE

A TRIPLE-BENEFIT INVESTMENT FOR PEOPLE, NATURE, AND CLIMATE

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FOREWORD

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TO AVOID THE WORST IMPACTS OF THE CLIMATE AND BIODIVERSITY CRISES AND ADVANCE CLIMATE JUSTICE, WE MUST INVEST IN HIGH-QUALITY SOLUTIONS, LIKE BLUE CARBON, THAT DELIVER OUTCOMES FOR PEOPLE, NATURE, AND CLIMATE.

Climate change is the biggest challenge humanity has ever faced, and it is unfolding at the same time as vast, human-caused biodiversity loss, as well as tremendous human suffering, inequality, and injustice. The scientific community overwhelmingly agrees that we must dramatically cut our greenhouse gas emissions within this decade to avoid devastating consequences as well as reverse biodiversity loss. Protecting and restoring ecosystems rich in carbon and biodiversity can provide up to ten gigatons CO_2e (carbon dioxide equivalent) emissions reductions (Grissom et al. 2017), roughly 30 percent of the mitigation needed to address this climate crisis.

Coastal ecosystems like mangrove forests, tidal marshes, and seagrass meadows sequester and store vast amounts of carbon and are now being recognized for their role in mitigating climate change (International Union for Conservation of Nature 2017).

These ”blue carbon” ecosystems serve as barriers against storm surges, flooding, and erosion. They provide critical habitats, clean our air and water, and regulate our climate by sequestering and storing carbon. Coastal blue carbon ecosystems are valued at over $190 billion in U.S. dollars per year (Bertram et al. 2021) and are estimated to reduce costs associated with impacts such as flooding by over USD $65 billion annually (Leal and Spalding 2022).

Despite providing these benefits, blue carbon ecosystems are some of the most endangered ecosystems on Earth, disappearing at a rate of 0.1–2 percent per year (Macreadie et al. 2021). To date, an estimated 67 percent of all mangrove forests have been destroyed by pollution, coastal development, extractive activities, and unsustainable aquaculture and agricultural practices. If current trends continue, our planet will be deprived of these precious ecosystems—and their many essential benefits and services—within a century (Pendleton et al. 2012).

The first priority must be to reduce greenhouse gas emissions and limit global warming to 1.5 degrees Celsius above preindustrial levels, per the worldwide agreement to curb climate change that was laid out in Paris in 2015. Investments that value nature as well as build resilience and adaptive capacity are key to meeting these goals. The international carbon market consists of carbon credits that represent avoided emissions or removed carbon (or its equivalent) from the atmosphere. High-quality nature-based carbon credits are a powerful tool for driving climate mitigation and resilience through the conservation and restoration of nature. The size of the voluntary carbon market (VCM) in 2021 was more than USD $1 billion annually (Ecosystem Marketplace 2021) and is projected to increase by a factor of 15 by 2030 and by 100 by 2050 (Blaufelder et al. 2021).

While blue carbon is currently a small slice of the carbon market "pie," blue carbon finance has the potential to grow overall investment in coastal and ocean nature-based solutions and resilience. This may occur through high-quality carbon credit projects that catalyze achievement of climate targets while protecting people, respecting and accounting for local knowledge and tenure rights, and securing biodiversity benefits. Mobilizing private and public-sector finance toward the protection and restoration of blue carbon ecosystems is, therefore, a significant opportunity.

Growing demand for blue carbon credits and the accompanying surge of interest in blue carbon have attracted many new actors into this space. To learn from the past as we look to future, we must align new and incumbent stakeholders around a shared vision for high-quality blue carbon that can achieve lasting and meaningful results for people, nature, and the climate. To develop this shared vision, we undertook an open and consultative research and outreach process over the first eight months of 2022. We engaged those working on the ground, trying to meet national targets and building sustainable investment portfolios. We listened to stakeholders from different sectors and learned about what they need to create high-quality blue carbon projects and credits. The results are articulated here in the form of principles and guidance that outline what high-quality blue carbon projects and credit development mean.

This is the beginning of a journey that we are taking together to ensure accountability, sustainability, and transparency in this marketplace, and much work remains. We hope these principles and guidance serve as a clear, high-quality foundation for moving forward with determination and collaboration to ensure high-quality and clear guardrails for sustainable market development.

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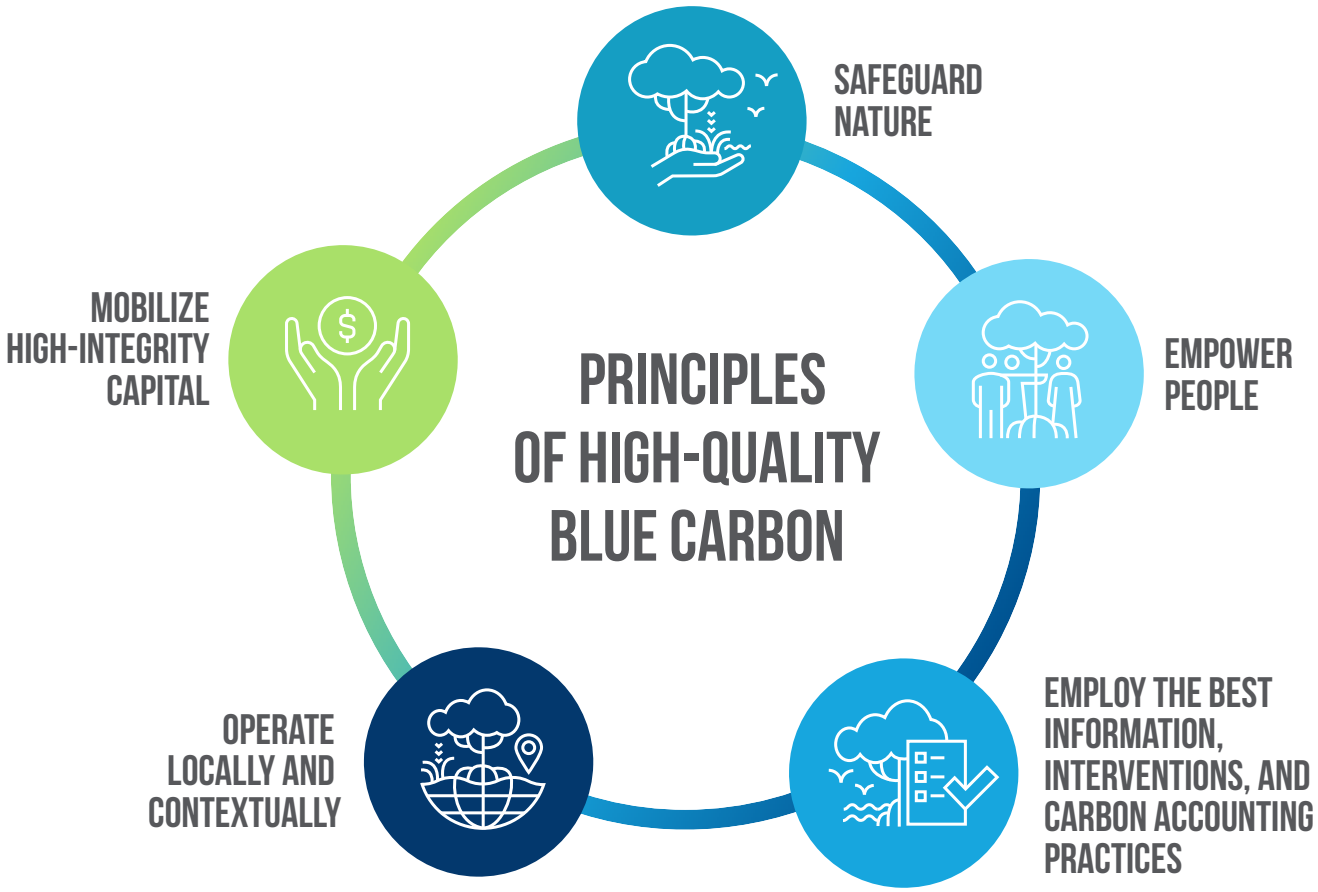
EXECUTIVE SUMMARY

AS A CONTRIBUTION TO THIS GROWING BODY OF WORK, THESE PRINCIPLES AND GUIDANCE HAVE BEEN DEVELOPED TO ALIGN STAKEHOLDERS AROUND A SHARED VISION FOR HIGH-QUALITY BLUE CARBON PROJECTS AND CREDITS. THIS SHARED VISION FOR QUALITY CAN SERVE A FOUNDATIONAL ROLE IN BUILDING CONFIDENCE IN AND MOMENTUM AROUND BLUE CARBON PROJECT DEVELOPMENT AND INVESTMENTS.

Urgent action is needed to address the climate and biodiversity crises and ensure climate justice globally. In addition to reducing emissions through technology and decarbonized supply chains, we need to invest in the incredible power of nature to build resilience, increase adaptive capacity, and mitigate the impacts of these global threats at scale. Investing in blue carbon projects is one powerful way to do so.

High-quality blue carbon projects can conserve, protect, and restore lost and degraded coastal ecosystems. In doing so, they can improve livelihoods, protect cultural heritage, maintain food security, and provide coastal protection for local communities. In addition, healthy coastal ecosystems improve water quality, serve as nursery grounds for fisheries, and capture and store carbon.



At the global level, the benefits of these ecosystems are often framed around mitigating climate change through reduced or avoided carbon emissions. But blue carbon ecosystems benefit local communities too. They support fisheries, create alternative livelihoods, and help community members meet day-to-day needs. Scientists, policymakers, and civil society increasingly recognize blue carbon ecosystems for their critical role in tackling the climate crisis and are dedicated to implementing high-quality blue carbon projects. Currently, the global supply of certified blue carbon credits is far outpaced by increasing demand. Key factors inhibiting high-quality blue carbon development relate to ecosystem complexity, knowledge gaps, and unique funding needs. The research gap has now closed considerably. Robust methodologies now also exist but must still be socialized and adopted. Further innovation is needed to find efficiencies in methodology application. Myriad teams around the globe are actively building solutions to source funding and overcome inhibitors to growth.

The five principles—each of equal importance—are guideposts to ensure that high-quality blue carbon projects and credits optimize outcomes for people, nature, and climate.

These principles and guidance were developed through a consultative and open process, drawing on the insights and learning of experts working on carbon markets, finance, policy, regulations, nature-based solutions, community resilience, and blue carbon. This work was sponsored by World Economic Forum's Friends of Ocean Action, Salesforce, Ocean Risk and Resilience Action Alliance, Conservation International, and The Nature Conservancy with support from Meridian Institute. We are very thankful to the scores of people who contributed through interviews, workshops, roundtables, written comments, and their own thought leadership. This document is the first step toward working with this broad community to promote and scale high-quality blue carbon initiatives.

This document elaborates on these principles and provides more detailed guidance on how to apply them in the context of blue carbon ecosystems by including the following components:

- A high-level **definition of high-quality blue carbon.**
- **Principles** that align with existing guidance for high-quality nature-based solutions broadly and serve a foundational role in further defining a shared vision for blue carbon.
- **Guidance** for the application of these principles within a blue carbon context.
- **Recommendations for participating** in the blue carbon space with integrity and impact.

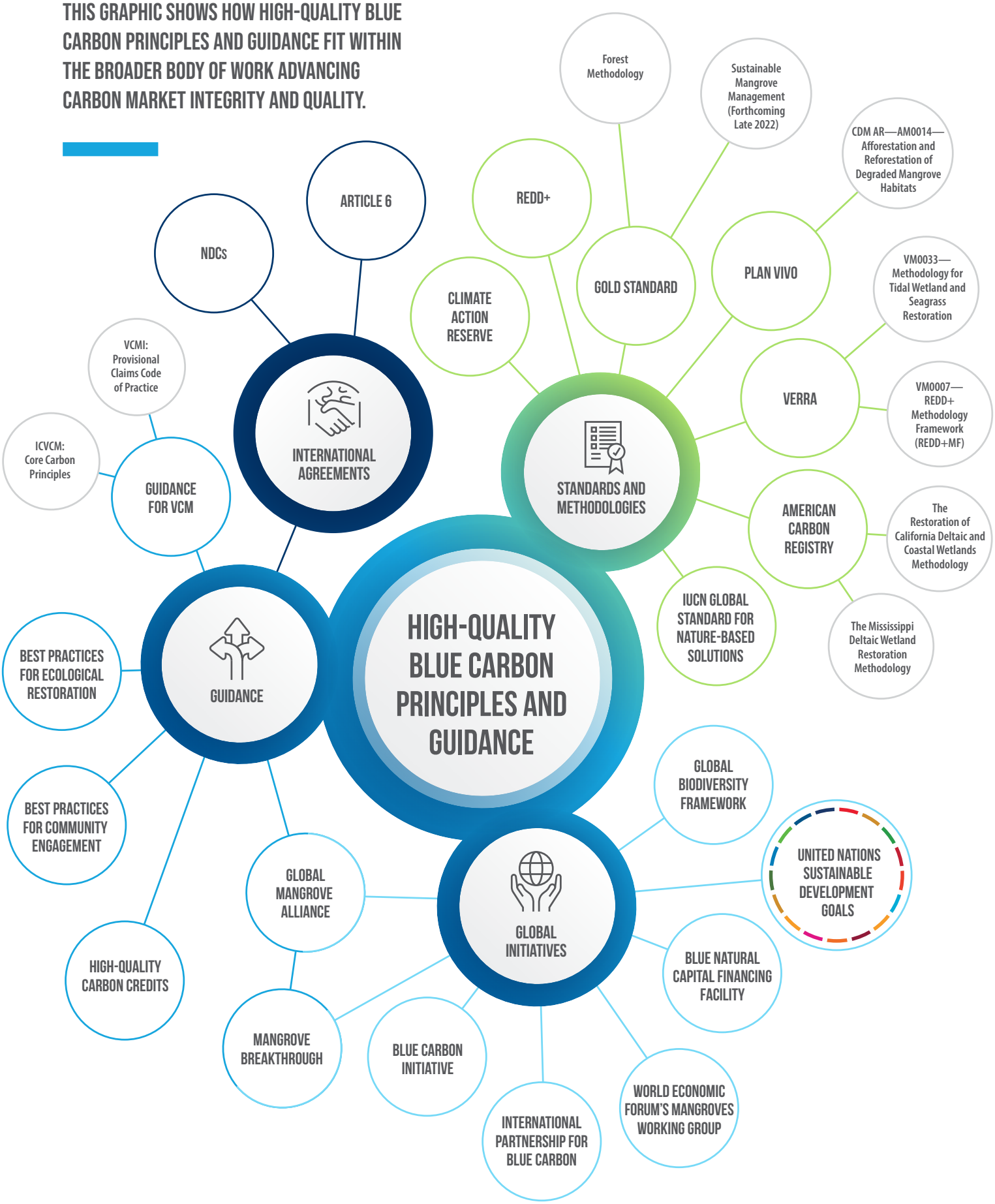
The term "blue carbon" used throughout this document refers to nature-based solutions in coastal and marine ecosystems where anthropogenic threats can be mitigated to measurably reduce climate change impacts using robust and accepted methodologies (see table in Appendix C). The blue carbon ecosystems currently associated with standards and methodologies based on the best available science are mangrove forests, seagrass meadows, and salt marshes and are the focus of this document. Other project types, such as seaweed conservation and kelp farming, require additional research and the development of new carbon methodologies, which are under development.

This document has been written to apply to new methodologies when they become available. Importantly, it is specific in scope. This report does not lay out a new standard; rather, it distills existing and emerging knowledge, guidance, and best practices[1] for application in the blue carbon context. While this document does not discuss blue carbon credits in the context of the compliance market, the application of these principles and guidance to the voluntary carbon market will provide a useful precedent for high-quality blue carbon in compliance markets in the future. These principles and guidance should be applicable and relevant for several years but, given the nascency of the marketplace, may need to be updated in the future.

Amid unpredictable and increasingly intense climate scenarios, we must have interventions that not only draw down carbon emissions but also ensure that communities and nature are resilient. Protecting and restoring blue carbon ecosystems are powerful interventions. Humanity continues to destroy these vulnerable ecosystems. Accelerated action to protect blue carbon ecosystems and mitigate climate change is critical and urgent. We will only be successful if actions are scientifically based, equitable, and globally embraced. Raising ambition to deliver high-quality projects and credits will deliver real outcomes. The time for action is now. Empowering the development of high-quality blue carbon projects is an investment in our common future.

1 Several initiatives are currently developing guidance for nature-based solutions and the voluntary carbon market more broadly. New guidance to compel good actors in the voluntary carbon markets, including the Integrity Council for Voluntary Carbon Markets' (ICVCM) Core Carbon Principles, the Voluntary Carbon Market Integrity (VCMI) Initiative's Code of Practice, and the Tropical Forest Credit Integrity (TFCI) guide are shaping the unregulated operating environment. ICVCM aims to inform the pathway to providing real, verifiable, high-integrity carbon credits. The VCMI effort is intended to govern how companies can use carbon credits to make transparent and credible claims toward net zero commitments. The TFCI guide helps companies differentiate between forest carbon credits. This document focuses on blue carbon within the context of these other efforts.

THIS GRAPHIC SHOWS HOW HIGH-QUALITY BLUE CARBON PRINCIPLES AND GUIDANCE FIT WITHIN THE BROADER BODY OF WORK ADVANCING CARBON MARKET INTEGRITY AND QUALITY.



AUDIENCE AND APPLICATION

This document presents a set of principles and recommendations to guide the development and procurement of high-quality blue carbon projects and credits. End-users include buyers, investors, suppliers, developers, and enablers, whom we collectively refer to as "blue carbon stakeholders" or simply, "stakeholders." We hope this guidance helps all users reach their goals to protect people, nature, and climate.

Just as the success of our endeavor to create this guidance hinged on diverse contributions, its impact hinges on its adoption and implementation by diverse end-users. We invite those working on and investing in blue carbon to test and apply these principles and guidance and develop new, innovative products for diverse use-cases. Stakeholders can implement these principles and guidance by:

- Referencing and including these principles and guidance in requests for proposals (RFPs), questionnaires, rubrics, and contracts and by sharing templates of such work products whenever possible.
- Developing individual project plans consistent with these principles and guidance.
- Developing toolkits that enable practitioners to quickly implement the principles and guidance.
- Publishing case studies to show what the principles and guidance look like and showcase their impact.
- Building capacity so blue carbon projects and/or crediting efforts that fall short of these principles and guidelines can make necessary improvements to achieve high quality.
- Internalizing these principles and guidance in all aspects of project assessment, design, and implementation.

We recognize that these principles and guidance define a vision for high-quality blue carbon across every project characteristic. We also recognize that few projects will likely meet every element of the guidance in full today. Our intent is not to set a bar that is impossible to reach and therefore exclusionary, but rather to provide a pathway for stakeholders to deliver the best possible outcomes for people, nature, and climate. With all the benefits nature provides, investing in high-quality blue carbon projects is a win-win strategy.

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PRINCIPLES

High-quality blue carbon projects and credits optimize outcomes for people, nature, and climate in a transparent and equitable way.

These projects (1) sequester and store carbon with high fidelity; (2) restore the ecological integrity and resilience of the ecosystem in question; and (3) open pathways for local and Indigenous communities to equitably participate in and benefit from the voluntary carbon market.

The following five principles—each of equal importance—along with the subsequent guidance are foundational to the development and deployment of high-quality blue carbon projects and credits.

SAFEGUARD NATURE

Blue carbon projects provide unique opportunities to preserve and enhance ecosystem resilience.

- Conserve our planet's remaining intact ecosystems.
- Design projects in accordance with science-based ecological protocols.
- Do no harm.

EMPOWER PEOPLE

Most blue carbon projects take place where people live and work. Blue carbon practitioners must implement social safeguards to protect and enhance community member rights, knowledge, and leadership and foster equitable access to the global carbon market.

- Ensure that free, prior and informed consent (FPIC) is established.
- Ensure inclusive participation and leadership of Indigenous Peoples and local communities (IPLCs), women, and other marginalized groups in project design, governance, and management.
- Ensure feedback, accountability, and grievance mechanisms are available to all rightsholders and stakeholders.
- Respect traditional land use practices and legal rights to land, resources, and carbon.
- Provide equitable access to the global voluntary carbon market by empowering local communities with the means to participate and lead.
- Ensure locally relevant gender integration.
- Empower local communities to define equitable benefit sharing.

EMPLOY THE BEST INFORMATION, INTERVENTIONS, AND CARBON ACCOUNTING PRACTICES

The integrity of the VCM hinges, in part, on the quality of information used to design projects and communicate the resulting carbon value of the credits generated.

- Use the most appropriate interventions and the best available scientific knowledge, including Indigenous, traditional, and local knowledge.
- Ensure transparent and accurate greenhouse gas accounting and monitoring by using a scientifically sound methodology or protocol.
- Establish accurate carbon baselines through evidence-based assessments.
- Demonstrate additionality using clear evidence and reasoning.
- Assess threats to durability.
- Establish measures to mitigate risk of reversal.
- Employ adaptive management protocols.
- Weigh the tradeoffs between actual and anticipated credit types.

OPERATE LOCALLY AND CONTEXTUALLY

Blue carbon ecosystems are incredibly heterogeneous with respect to their role in local customs; gender and power dynamics; resource use, management, and ownership regimes; and social, policy, and governance structures.

- Design projects according to the local social and ecological context.
- Account for the local implications of international policies.
- Advance policies to promote high-quality blue carbon project development.
- Establish a diverse network of local partners to ensure project success and longevity.

MOBILIZE HIGH-INTEGRITY CAPITAL

We cannot achieve the best outcomes for people, nature, and climate without high-integrity financial flows.

- Set science-based targets for limiting global average temperature increase to 1.5 degrees Celsius and compensate for remaining emissions with high-quality carbon credits.
- Design agreements and contracts to promote fair and transparent pricing and compensation.

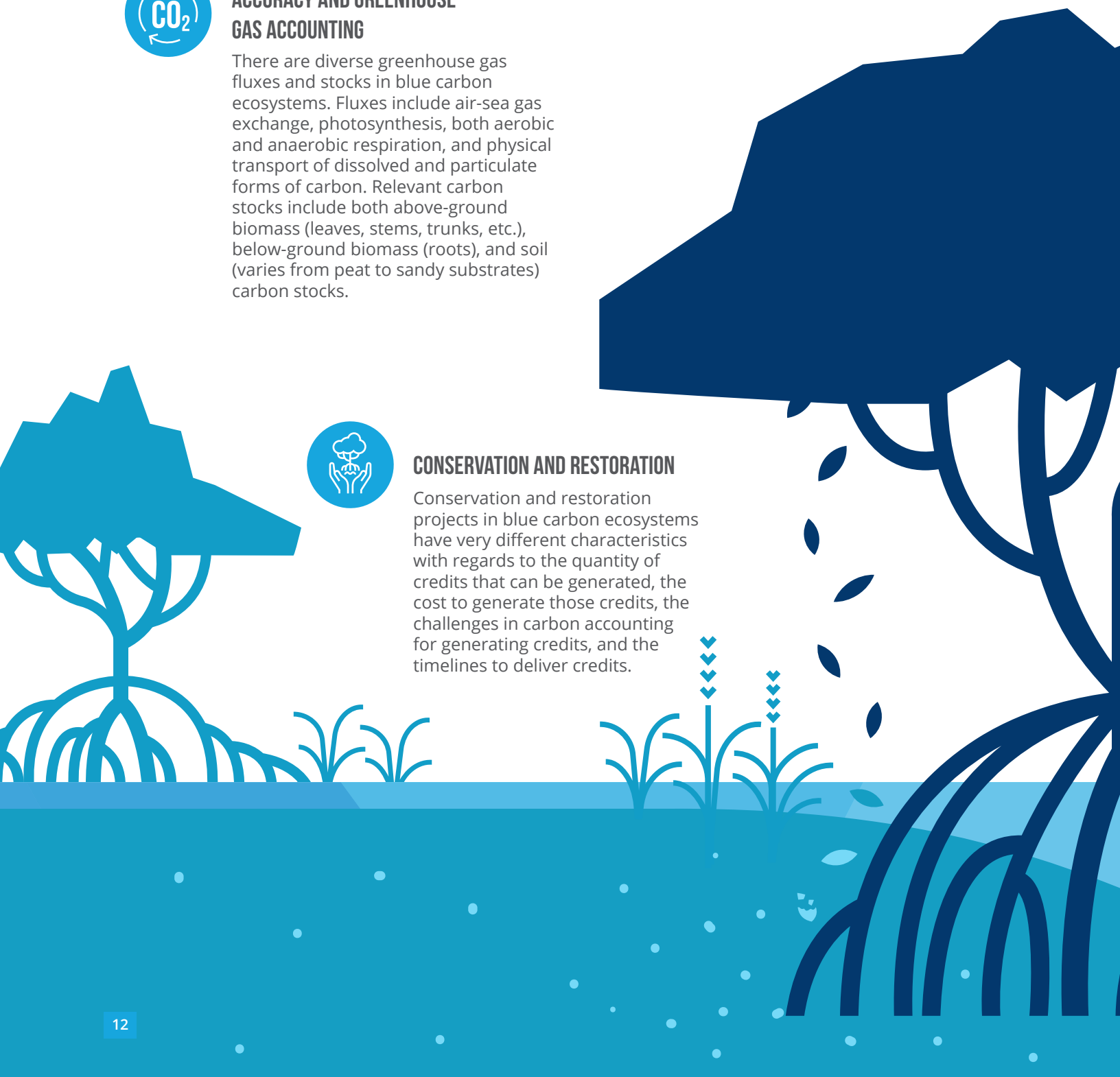
UNIQUE CONSIDERATIONS IN BLUE CARBON ECOSYSTEMS

ADAPTIVE MANAGEMENT

Adaptive management plans for blue carbon projects will likely need to account for one or more of the following long-term changes in marine and coastal environments: sea level rise and fall, warming seas, and more frequent and intense storms.

ACCURACY AND GREENHOUSE GAS ACCOUNTING

There are diverse greenhouse gas fluxes and stocks in blue carbon ecosystems. Fluxes include air-sea gas exchange, photosynthesis, both aerobic and anaerobic respiration, and physical transport of dissolved and particulate forms of carbon. Relevant carbon stocks include both above-ground biomass (leaves, stems, trunks, etc.), below-ground biomass (roots), and soil (varies from peat to sandy substrates) carbon stocks.



CONSERVATION AND RESTORATION

Conservation and restoration projects in blue carbon ecosystems have very different characteristics with regards to the quantity of credits that can be generated, the cost to generate those credits, the challenges in carbon accounting for generating credits, and the timelines to deliver credits.

ADDITIONALITY AND BASELINES

If the resource protection interventions do not involve the management of carbon assets, or are not being fully implemented, then a blue carbon project may be able to demonstrate additionality. For example, in a marine protected area where fishing regulations are enforced but regulations on mangrove extraction are not enforced, a project can demonstrate additionality. Projects must continue to assess the circumstances over time and adapt accordingly.

DURABILITY AND RISK OF REVERSAL

All natural climate solution projects are subject to some risk pertaining to durability. Blue carbon projects face marine-specific risks, including sea level rise and fall, extreme storms, ocean temperature change, and other climate change scenarios that play out over multiple timescales. Scientific models for these threats to durability should be used to estimate durability horizons and communicate the associated level of uncertainty or risk associated with those horizons.

MITIGATING RISK OF REVERSAL

One measure to mitigate marine-specific risks is to take a landscape, seascape, or "ridge-to-reef" approach. By protecting and restoring neighboring ecosystems, projects can enhance the resilience of the blue carbon ecosystem. For example, a healthy coral reef can protect a seagrass bed or mangrove forest. Likewise, a healthy upland forest and watershed can enhance the resilience of a mangrove forest downstream.

LOCAL CONTEXT IN BLUE CARBON ECOSYSTEMS

The local context, both social and ecological, can be incredibly heterogeneous within a blue carbon project area. A coastline or atoll is often a patchwork of intermixed mangrove, seagrass, and coral reef ecosystems.

GUIDANCE

The following guidance elaborates on the above principles and details special considerations for applying them within a blue carbon context. Please note: the order in which the principles are presented does not reflect prioritization.

This guidance is meant to inform the decisions and actions of blue carbon stakeholders so as to steer their activities toward the best possible outcomes for people, nature, and climate.

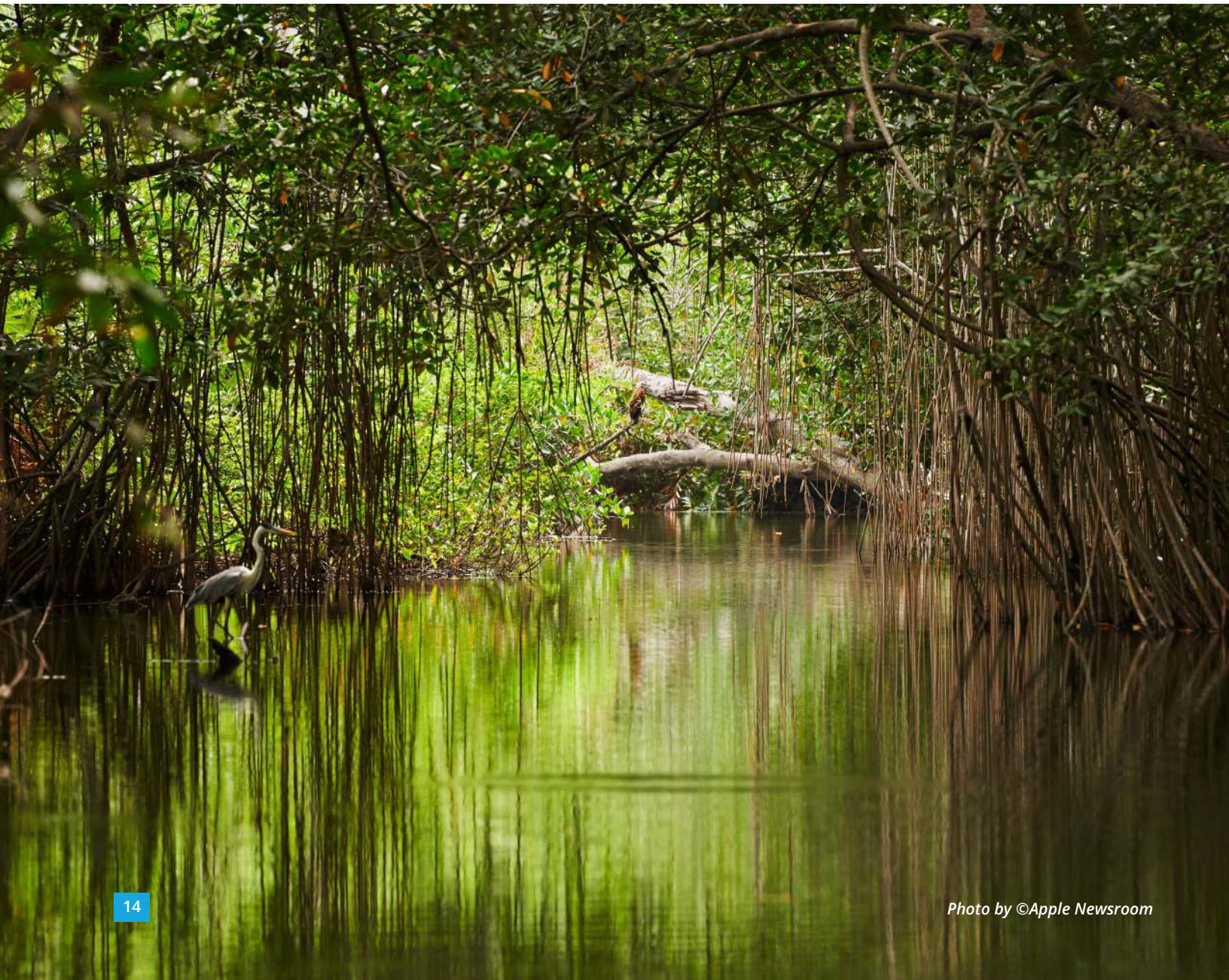


Photo by ©Apple Newsroom

SAFEGUARD NATURE

- **Conserve the remaining intact ecosystems on our planet.** While restoration is and will be needed, it rarely, if ever, fully restores the diversity and integrity of degraded or destroyed systems. Avoiding emissions and preventing nature-loss is as important as removing greenhouse gasses from the atmosphere and restoring ecosystems. While market demand often prefers restoration, stakeholders should also prioritize conservation of current ecosystems. Combining conservation and restoration sites increases the potential locations where projects could be implemented, and the higher carbon benefit from conservation may subsidize restoration costs.

- **Design projects in accordance with science-based ecological restoration protocols** to maintain or improve the health of the ecosystem. Projects must be designed to recover ecological integrity and connectivity and to enhance opportunities for natural regeneration. Restoration inherently implies that the project objective is to rebuild an ecosystem that is either no longer extant or that is heavily degraded in an area. Site selection must meet the right hydrological and substrate requirements for the ecosystem type. Appropriate species must be selected for revegetation efforts. Projects must also manage biodiversity, resilience, and ecological adaptation in the face of evolving conditions due to climate change.

- **Do no harm.** Project developers must avoid causing ecological disturbance or other environmental damage including, but not limited to, loss of biodiversity, habitat loss, habitat conversion, invasive or non-native species introduction, reduced water quality, increased erosion, and increased net emissions. Conservation and restoration projects in blue carbon ecosystems have very different characteristics with regard to the quantity of credits that can be generated, the cost of generating those credits, the challenges in carbon accounting of generating credits, and the timelines to deliver credits.

CONSERVATION AND RESTORATION IN BLUE CARBON ECOSYSTEMS

Conservation is less expensive and delivers a greater quantity of credits because of the high amount of carbon stocks being protected. However, demonstrating additionality in conservation projects can be difficult because, as in other nature-based conservation crediting projects, the project must prove that a negative impact *didn't* happen because of the project interventions. In most cases, this is determined based on a reference region with similar threats and governance. However, unlike in forestry, where most threats relate to logging, threats in blue carbon systems can vary greatly from one location to the next (e.g., cutting for charcoal production may threaten one location while sedimentation changes related to water diversion for agriculture fields may threaten another). This makes finding enough comparable areas difficult and referencing region accuracy more uncertain.

Restoration involves longer time horizons for removing carbon from the atmosphere because, in some cases, like mangrove and other forests, it takes years for the ecosystem to re-establish itself and be mature enough to begin capturing soil carbon. Similarly, in marshes and seagrasses, the grass itself can be quickly restored but lost soil carbon regenerates very slowly. Restoration projects are often more costly because interventions that may be required, like hydrological engineering and occasional planting, are costly. For restoration projects, methodologies for establishing a baseline and then modeling carbon sequestration require (1) a proxy site to prove removals and (2) accurate projections of emissions levels over time if the project were not to occur. (See "Additionality and Baselines in Blue Carbon Ecosystems" above.)

EMPOWER PEOPLE

- **Ensure free, prior and informed consent (FPIC) is established.** As a fundamental right of Indigenous Peoples and Local Communities (IPLCs), free prior and informed consent (FPIC) is considered a best practice and must be the first step for any blue carbon project. FPIC involves meaningful and culturally appropriate consultations with stakeholders engaged with or impacted by a project through their representative institutions and by means in which they can freely participate. This requires regular engagement on project information, progress, and results over the course of the project lifetime in local languages and in formats that are widely accessible to stakeholder groups (i.e., written, video, in-person meetings, etc.). It also means ensuring sufficient context and information are communicated to key representatives to build their understanding of the intended project's activities and outcomes. These engagements must take place prior to any exploration of resources. Communities must also have appropriate time and resources to internalize and conceptualize the information provided in relation to the project. This may necessitate that the community be supported with resources in the form of acceptable experts to advise them on the project.

  Under FPIC, communities have the full powers of consent, which include the right to withdraw or withhold consent and/or refuse any mitigation activities at any point.[2]

- **Ensure inclusive participation and leadership of IPLCs, women, and other marginalized groups in project design, governance, and management.** Projects must be designed through an inclusive approach that recognizes and engages key stakeholder groups. The highest-quality projects are those in which communities have a significant governance and management role or that are led entirely by the community. Community partnership, buy-in, and agency in shaping and driving a project enhance the project's durability and integrity.

- **Promote locally relevant gender integration.** Experience shows that sustainable changes are most fully realized through activities focused on engaging both men and women in successfully implementing projects and deliver beneficial climate and social outcomes. The safety of all people, but especially marginalized populations such as women and children, should be prioritized in all aspects of project design and implementation. Gender equity is especially important in blue carbon ecosystems where communities rely on coastal wetlands for sustenance through fisheries and food production. In many mangrove forests, women tend to rely on and manage coastal resources (e.g., shellfish harvesting), whereas men tend to focus more time and effort on near- and off-shore fisheries. Projects should be designed to take gender considerations into account.

➔ **Ensure feedback, accountability, and grievance mechanisms are available to all rightsholders and stakeholders.** Local resource users and communities must have opportunities to express concerns and receive responses (including mitigation and compensation measures) to their concerns if they are adversely impacted by project activities. This is essential to ensure fair and equitable benefit sharing determined jointly with affected communities and stakeholders. To ensure effective implementation, project developers must adapt the project activities according to changing community needs and evolving circumstances. Project developers and investors must partner with and be accountable to communities, including IPLCs, that may be involved with and/or impacted by the project, irrespective of the type or magnitude of its impact.

➔ **Respect traditional land use and legal rights to land, resources, and carbon.** Developers must identify the owners of a project's land, resources, and carbon rights because ownership of these elements varies. The policy, legal, and governance mechanisms that govern how finances will flow in accordance with ownership rights must be established. These conditions include:

- Clarity over carbon rights and land tenure so stakeholders understand who owns and can transact blue carbon.
- Clear benefit-sharing arrangements that establish how finances will flow.
- Transparency and safeguard mechanisms to ensure beneficiaries understand the application and use of finances.
- Fair and effective participation of IPLCs.
- Robust monitoring systems.

➔ **Provide equitable access to the global VCM by empowering local communities with the means to participate and lead.** A holistic development approach is needed to create and enable communities to invest in conservation while still meeting other basic needs. Third-party developers, for example, should consider offering community members the opportunity to manage or share management of a project. If communities elect to have a management role, project developers should provide resources for the requisite capacity building. This may include enhancing communities' capacity to engage in carbon markets and manage ecosystem resources, possibly in partnership with local universities. It may also necessitate training in areas including financial literacy, sustainable resource management, ecological restoration, and scientific measurements, monitoring, and reporting. Data collected for use in the project must be shared with local stakeholders using communication tools that are appropriate to the context to ensure all parties are well informed.

➔ **Empower local communities to define equitable benefit sharing.** Voluntary carbon market finance is a tool for providing regular and predictable funding into projects to secure the long-term management and protection of carbon-rich environments, which also benefit local communities. Ultimately, projects must deliver on their climate change mitigation outcomes and be designed to enhance the livelihoods, food security, wellbeing, and resilience of local communities. Good governance arrangements must be integrated into the project's structure from the outset, and beneficiaries must be able to obligate funds where they are most important for the community.

There are as many structures of benefit sharing as there are projects themselves. Benefit-sharing arrangements must (1) be negotiated before the sale of credits; (2) transparently disclose the portion of revenues that goes directly to communities; and (3) clearly indicate how those funds are apportioned. The project costs, finance flows, and revenue sharing must be transparent so that communities and stakeholders have the information they need to determine whether the benefit-sharing structure is fair. Case studies should be developed to showcase benefit-sharing structures that work well for invested stakeholders.

2 The United Nations Food and Agriculture Organization guidelines offer the following steps for implementing FPIC. Note that each step must be extensively documented:

- Identify the Indigenous People's needs, concerns, perspectives, and appropriate representatives.
- Document geographic and demographic information through a participatory stakeholder-mapping process.
- Work with key self-determined representatives to design a communications plan for the project that enhances transparency and effectively informs and engages stakeholders.
- Receive and document consent and identify and communicate how the needs of Indigenous Peoples and local communities are addressed in the project.
- Establish an accountability and grievance mechanism with robust local contact points to ensure key stakeholders can submit feedback and/or grievances at any time.
- Conduct participatory monitoring and evaluation of the project.
- Document lessons learned and share information about project achievements broadly.

EMPLOY THE BEST INFORMATION, INTERVENTIONS, AND CARBON ACCOUNTING PRACTICES

➔ **Use the most appropriate interventions and the best available scientific knowledge, including Indigenous, traditional, and local knowledge.** To ensure a successful project, make appropriate ecological and social interventions. For example, survival rates for mangrove restoration projects have been as low as 10-20 percent in recent years. However, following the best scientific and conservation practices, such as repairing hydrology and planting native species in appropriate locations, can boost mangrove survival rate to 85-90 percent after three to four years. Best practices include conducting a root-cause analysis that uncovers the drivers of ecosystem destruction and tailoring interventions accordingly. Projects might require a suite of interventions and technologies that span social considerations, such as livelihoods, sustenance, and wellbeing, as well as ecological considerations including hydrology and biodiversity.

Robust science is fundamental to the quality of standards and methodologies and to the quality of the projects themselves. Additionally, IPLCs who have lived in or near project locations possess extensive traditional knowledge regarding native vegetation and ecosystem dynamics. To optimize project outcomes, scientific and historical knowledge of the local landscape should therefore be paired with traditional knowledge as well as proven conservation and project methods.

➔ **Ensure transparent and accurate greenhouse gas accounting and monitoring by using a scientifically sound methodology and protocol.** A partial list of widely accepted blue carbon methodologies is provided in Appendix C, along with some characteristics of each methodology. All actors participating in blue carbon transactions are strongly encouraged to track publication of both new and updated methodologies and to contribute data and feedback to improve them. Robust methodologies must be transparently applied and should follow sound science and best practices. This means assumptions are stated clearly and justified, the most accurate and transparent accounting approaches are followed, and emissions factors and activity data are well documented. When possible, locally available data (such as site-specific sampling) should be employed because it yields the highest-quality carbon accounting. However, simply applying peer-reviewed default values may be appropriate in some cases. Best practice is to approximate carbon benefits using default values to initiate a project and then invest in further site-specific sampling to create more robust carbon accounting over time.

Stakeholders are strongly encouraged to consider independent third-party assessments of methodologies used to understand their weaknesses and strengths. Third-party assessments help project developers make informed choices about which methodology to apply to their specific project contexts and objectives and help buyers and investors better understand risks associated with projects

With respect to ongoing monitoring, additional innovation and investment are needed to find scalable and affordable solutions and technologies due to the inherent challenges of measuring and estimating carbon fluxes and stocks in aquatic systems. In the meantime, stakeholders should use the best available monitoring tools and methodologies.

➔ **Establish accurate carbon baselines through evidence-based assessments of the ecosystem and the amount of carbon it may store or capture.** A counterfactual baseline is the cumulative greenhouse gas emissions that would have been emitted if the project activities had not been implemented. The counterfactual is the most likely business-as-usual effect, were the project not to exist.

Existing methodologies offer different tools and methods for calculating a counterfactual baseline. Given the types of data and nuance required to set the baseline, project developers may need to apply certain assumptions. To ensure high-quality carbon baselines that do not risk overestimating projects' mitigation benefits, project developers must clearly explain key assumptions and calculations and support them with accurate and relevant data. Sufficient information in the publicly available version of project documents should be provided so that others can easily and comprehensively understand how the baseline was created. Project developers should seek to establish accurate and conservative baselines that align with national or subnational greenhouse gas accounting.

Transparent records of scientific methods should be made publicly available as a contribution to the broader national, regional, and global knowledge and data on blue carbon activities and to facilitate the adoption of subnational accounting of blue carbon ecosystems.

➔ **Demonstrate additionality using clear evidence and reasoning.** Emissions reductions and/or removals are considered additional only when carbon finance plays a decisive role in instigating the project activity and intervention. Projects are not additional when the mitigation activity would have taken place in the absence of carbon finance due to other incentives or systematically enforced laws, regulations, or government policies.

Project developers must demonstrate additionality using clear evidence and reasoning. Additionality may be demonstrated through investment analyses and/or barrier analyses that prove that project activities would not likely occur without additional funding, technical expertise, or policy intervention. These analyses are already utilized by some existing carbon accounting methodologies for select blue carbon project types (e.g., tidal wetland restoration within the United States). Additionality may also be demonstrated by benchmarking against an appropriate comparable reference site (i.e., one with similar characteristics, such as those relating geography, size, and ecosystem type).

ACCURACY AND GREENHOUSE GAS ACCOUNTING IN BLUE CARBON ECOSYSTEMS

There are many greenhouse gas fluxes and carbon stocks to track in aquatic ecosystems. Fluxes include air-sea gas exchange, photosynthesis, aerobic and anaerobic respiration, and physical transport of dissolved and particulate forms of carbon. Anaerobic respiration, particularly methanogenesis, should be considered because methane is such a potent greenhouse gas. The methane flux, and thus its impact on project-level accounting, is often uncertain. Relevant carbon stocks include above-ground biomass (leaves, stems, trunks, etc.), below-ground biomass (roots), and soil (which varies from peat to sandy substrates) carbon stocks. Carbon cycles on a variety of timescales in aquatic systems, and carbon storage varies spatially according to physical and biological conditions.

The quantity of fluxes and variability over time and space make it costly to constrain the carbon system with confidence. Default values can circumvent expensive instrumentation and sampling protocols. But they come at a high cost—the potential for compromised accuracy—and should therefore be used conservatively.

Significant carbon stocks u nderground, or under water in the case of seagrass, are challenging to monitor remotely. While above-ground carbon stocks in mangrove forests can readily be estimated and monitored using satellite or drone imagery, below-ground carbon stocks, marsh grasses, and underwater seagrasses are not as easily estimated with this type of data collection. Instead, proxies, in situ samples, or new technology may be needed to enable accurate accounting.

ADDITIONALITY AND BASELINES IN BLUE CARBON ECOSYSTEMS

Demonstrating additionality presents unique challenges for certain blue carbon conservation projects, particularly because of the overlap between blue carbon ecosystems and declared marine protected areas, national conservation priorities, and sustainable coastal wetland management (where protections may focus on fisheries management rather than maintaining blue carbon ecosystems).

If resource protection interventions do not involve management of carbon assets, or are not being fully implemented, then a blue carbon project may be able to demonstrate additionality. For example, a project in a marine protected area where regulations on fishing but not mangrove extraction are enforced can demonstrate additionality. Projects must continue to assess whether such regulations are systematically enforced throughout the project lifetime (e.g., through periodic updates to the carbon baseline).[3] Demonstrating economic additionality for blue carbon projects is similarly challenging, mostly due to a lack of viable comparison scenarios.

To establish additionality and baselines, the following requirements specific to the blue carbon context should be considered.

- For conservation projects, establishing a baseline and additionality usually includes an analysis of the drivers, rates, and patterns of deforestation, degradation, and/or wetland conversion. Many blue carbon ecosystems face drivers of loss that are instigated upstream (e.g., sedimentation or poor water quality).These are often more difficult to measure and include in projections.

- For restoration projects, the baseline should account for both emissions removed (i.e., carbon captured by the ecosystems as it is re-established, also known as removals) as well as those that are avoided. The requirement to account for avoided emissions is unique to blue carbon ecosystems because, when they are destroyed, the carbon-rich soil can emit carbon for up to two decades. The amount of avoided emissions depends on when the intervention happens relative to the original destruction. If the project is initiated after all the carbon in the soil has been emitted, then the counterfactual baseline is zero for avoided emissions, akin to a reforestation project.

Further complications include:

- The lack of readily available data needed to establish baselines across all blue carbon ecosystems.

- The high cost of soil analysis needed to determine the project's organic carbon content.

➔ **Assess threats to durability.** Permanence—typically defined as carbon stocks not being emitted for more than 100 years—is the most commonly used term to refer to the length of time that carbon stocks associated with carbon credits remain sequestered in the ecosystem. However, in the context of blue carbon, the term "durability" is more appropriate because it allows stakeholders to compare the longevity of carbon stocks, which can endure for decades, centuries, or millennia. A stock's durability depends on political, social, environmental, management, financial, and other factors, which can stem from direct or indirect anthropogenic impacts (e.g., natural disturbances associated with climate change). For these reasons, project developers must assess and transparently communicate risk.

➔ **Establish measures to mitigate risk of reversal.** Mitigation measures should be put in place to address risk of reversal and ensure durability over the longest timescale possible.[4] Some standards require project developers to set aside a buffer pool of credits (that cannot be purchased) to cover any reversals of carbon benefits over time. Management for reversal may include landscape-scale project management and social and livelihood improvements to reduce pressures on ecosystem resources. Projects that implement activities to mitigate the risks of reversal and improve the likelihood of long-lasting carbon benefits may be able to reduce the portion of project credits that are kept in a buffer reserve (i.e., aren't sold).

➔ **Employ adaptive management protocols.** Project developers should employ adaptive management protocols in the project design to adjust to changing conditions and circumstances. Ongoing changes from climate disruption may impact blue carbon projects. Adaptive management helps ensure the longest carbon storage possible; ongoing monitoring and evaluation must be conducted to identify and resolve emergent threats to project success.

As part of their due diligence, investors should ensure that adaptive management protocols are implemented. While such management practices may bear increased costs, they allow project developers to nimbly navigate project difficulties, reducing risk for all project stakeholders.

3 Refer to methodologies of Plan Vivo and Verra.

4 Note: Most guidance uses the term "permanence;" we use "durability" to reflect the reality that carbon storage comes with a timescale, be it decades, centuries, or millennia (see the glossary).

In response to changes in management protocol, investors, as long-term partners, should also be nimble and responsive to evolving project finance needs.

➔ **Weigh the tradeoffs between actual and anticipated credit types.** Blue carbon stakeholders should weigh the tradeoffs between producing *ex post* credits (actual credits that have been earned and validated) versus *ex ante* credits (credit estimates related to future work) when deciding how to participate in the market. Ex post credits are often preferred, and fetch high prices on the market, because they reflect emissions that have already been reduced or avoided and validated with rigorous monitoring and verification. They can also be retired and used to make offsetting claims. However, a policy to purchase only ex post credits could exclude local communities that lack the resources to overcome the multiyear and capital-intensive barriers to develop a blue carbon project.

Ex ante credits (also called forward credits or forward units) are sold in anticipation of future emissions reductions or avoidance. Until they have been verified and converted into a carbon credit under a recognized standard, ex ante credits cannot be used to make claims regarding neutralization or carbon neutrality. Ex ante credit instruments carry risk because they are based on projections around future project outcomes, which can be highly variable. The type of credit generation requires a certain level of information and analysis to develop a well-supported claim of the projections. The risk that ex ante credits may not be generated at the rate estimated creates uncertainty regarding the performance of these projects.

Forward sale of future credits is one pathway to provide much-needed capital to projects and communities in advance of project implementation and credit verification and issuance. However, project developers can secure upfront finance in other ways. Many funders are willing to consider concessionary funding to support upfront project costs, which can be done through philanthropy, bonds, debt-restructuring, or with patient capital investors who are willing to defer returns. Other options can include a right of first refusal[5] or a discount from current market price at time of issuance in exchange for the risk assumed by the investor. Project proponents should explore all options.

5 Right of first refusal means that an entity has the opportunity to enter into a business transaction (i.e., purchase carbon credits) before others do.

DURABILITY AND RISK OF REVERSAL IN BLUE CARBON ECOSYSTEMS

All natural climate solution projects are subject to some risk pertaining to durability. Blue carbon projects face marine-specific risks including sea level rise and fall, extreme storms, ocean temperature change, and other climate change scenarios that play out over multiple timescales. Scientific models for these threats should be used to estimate durability horizons and communicate the associated level of uncertainty or risk associated with them.

MITIGATING RISK OF REVERSAL

One measure to mitigate marine-specific risks is to take a landscape, seascape, or "ridge-to-reef" approach. Projects that protect and restore neighboring ecosystems enhance the blue carbon ecosystem's resilience. A healthy coral reef, for example, can protect a seagrass bed or mangrove forest. Likewise, a healthy upland forest and watershed can enhance the resilience of a downstream mangrove forest.

ADAPTIVE MANAGEMENT IN BLUE CARBON ECOSYSTEMS

Adaptive management plans for blue carbon projects will likely need to account for one or more of the following long-term changes in marine and coastal environments: sea level rise and fall, warming seas, more frequent and intense storms, and other climate change scenarios that play out over multiple timescales. Large-scale trends in sociopolitical dynamics and human activities (such as increased migration of people to and/or away from the coast) can also impact the success of a project. Additional biodiversity loss or species movement might deliver cumulative or accelerated negative impacts. While these forces are outside the project team's immediate control, they should be accounted for in calculations of durability and risk of reversal and addressed in adaptive management plans.

OPERATE LOCALLY AND CONTEXTUALLY

- **Design projects according to the local social and ecological context.** Local context includes customs; gender and power dynamics; resource use, management, and ownership regimes; and social, policy, and governance structures. Project developers must conduct due diligence to understand the local context. Project design and governance structure must be informed by the local context on a site-by-site basis.

- **Account for the local implications of international policies.** Project developers should, to the extent possible, account for local implications of global policies when designing projects. One critically important global policy with potential local implications is Article 6 of the Paris Agreement. The process for issuance and approval of the project, and determining whether national authorizations for corresponding adjustments are available and/or required for the VCM, will be decided on a country-by-country basis. Policy should be designed to encourage the requisite funding for conservation and restoration projects that will deliver the best possible outcomes for people, nature, and climate. Project proponents should be aware of national conversations on voluntary carbon markets and should plan to adapt accordingly.

- **Advance policies to promote high-quality blue carbon project development.** Where policy barriers inhibit high-quality carbon project success, blue carbon stakeholders should consider advocating for policy change. Carbon credit proponents and actors should understand and take into consideration national rules and guidance for carbon market transactions. New regulations and accounting approaches may need to be developed to ensure the appropriate incorporation of blue carbon projects in jurisdictional regimes and Nationally Determined Contributions (NDCs). Blue carbon proponents and actors can be influential advocates for the policy changes needed to enable and promote blue carbon project development. Early movers are the closest to the space and often the first to spot gaps or weaknesses in regulatory regimes. Developers and investors may join industry associations, individually lobby and educate policymakers and regulators (i.e., in the context of developing and gaining approval for their projects), or provide granular insight into policy and regulatory development processes.

- **Establish a network of diverse local government partners to ensure success and longevity of the project.** To move a project forward, securing local buy-in is essential. This is especially true given that much coastal landscape falls under government ownership and management and that national governments are increasingly claiming carbon rights. Project developers must know which natural resource management ministries have management authority over resources (including water, forest,[6] and fisheries authorities) and must engage them as valued partners.

LOCAL CONTEXT IN BLUE CARBON ECOSYSTEMS

The local context, both social and ecological, can be incredibly heterogeneous within a single blue carbon project area. A coastline or atoll is often a patchwork of intermixed mangrove, seagrass, and coral reef ecosystems. While blue carbon ecosystems occupy intertidal and subtidal zones, which are primarily government-owned lands, they may extend landward and straddle publicly and privately owned lands.

Additionally, the official national definitions of these ecosystem types and their designations under various government ministries are often unclear. In some countries, for example, statutes do not clearly define mangrove ecosystems as either forests or marine ecosystems. Therefore, it is unclear if mangroves are managed by the ministry of forests or the ministry of marine resources.

Finally, coastal communities are often small and operate independently of one another, rather than in a coordinated or homogeneous fashion. For these reasons, the land and resource ownership and management regimes, as well as cultural considerations, vary and are sometimes unclear in blue carbon ecosystems or seascapes. Project developers must account for such heterogeneity on a site-by-site basis within their project plans in order to successfully deliver on the guidance outlined under the "Empower People" principle concerning governance, FPIC, carbon rights, feedback and grievance mechanisms, capacity building, and benefit sharing.

6 Regulations of mangroves may differ from those of marshes and seagrasses depending on whether national definitions of forests include mangroves and thus subject them to Forest Reference Emission Levels.

MOBILIZE HIGH-INTEGRITY CAPITAL

➔ **Set science-based targets for reducing emissions in line with limiting global average warming to 1.5 degrees Celsius and compensate for any remaining emissions with high-quality carbon credits.** To curb climate change, all companies must reduce their carbon emissions in line with science-based targets. Purchasing carbon credits to compensate for any remaining emissions is an incredibly powerful tool to drive change. These actions are not interchangeable or in conflict but rather complementary. Committing to maintaining net zero residual emissions supports a buyer's emissions reductions because purchasing carbon credits effectively sets an internal "price on carbon," which is, at a minimum, the cost of buying credits needed to compensate for emissions the buyer cannot yet reduce. This, in turn, incentivizes organizations to invest in solutions that reduce emissions, making "business as usual" less desirable than innovation.

➔ **Design agreements and contracts to promote fair and transparent pricing and compensation.** Fairly priced carbon credits likely offer the best assurance of project durability as well as outcomes for people, nature, and climate. Elements for consideration include, but are not limited to, the following:

- Project costs are transparently accounted for to ensure that investors and project developers have a mutual understanding of which activities and expenses are included in their agreement.
- Revenue is sufficient to support community benefit-sharing agreements.
- Credit price is set to ensure that core project costs are covered over the lifetime of the project while also recognizing that some project activities may be funded through diverse funding sources.
- Climate change impacts are considered in contract design and risk/reward allocation agreements and parties to the agreement are prepared to adjust as climate impacts manifest over the life of the project and/or contractual agreements.
- Long-term agreements (1) are designed to be mutually acceptable to all involved parties with clear allocation of risks and rewards and how they might change over time and (2) have a range of tools (e.g., floating prices,[7] escalation clauses,[8] discounting, etc.) to account for and reflect changing market conditions.
- Foreseen risks are allocated to participating parties based on mutual agreement and consider the parties' influence over those risks, the potential return, and/or exposure to underperformance (e.g., a project does not yield as many credits as anticipated), and their ability to absorb the impact of underperformance. Investors in these sectors might purchase risk transfer products such as insurance and guarantees to protect against potential underperformance.

7 The term "floating prices" refers to variables that can affect the price of a credit.

8 Escalation clauses in contracts allow for increases or decreases in price based on certain conditions.

Tidal Marsh, Photo by creativenature.nl, adobe stock

RECOMMENDATIONS

BUYERS AND INVESTORS

Above all, companies must ensure that the use of carbon credits is additional to, rather than a substitution for, their own reductions in direct and value chain emissions. Buyers and investors should:

➔ **Set science-based emissions reduction targets and make progress toward decarbonization in their operations and supply chains.** Companies should follow high-integrity climate action,[9] including:

- Setting transparent net zero targets that are based on the best available science and interim emissions reduction targets across Scopes 1, 2, and 3.[10]
- Making consistent progress toward meeting those targets.
- Providing detailed information on plans and strategies adopted to achieve targets and committing to retire procured carbon credits.
- Maintaining a publicly available, third-party validated greenhouse gas emissions inventory that follows the *GHG Protocol*[11] (or equivalent) and covers all Scope 1, 2, and 3 emissions.
- Demonstrating how the company's advocacy activities are consistent with Paris Agreement goals and do not block ambitious climate regulation.

9 One example of emerging best practices is the *VCMI Claims Code of Practice* currently under development.

10 Scope 1 and 2 emissions refer to emissions that are owned and controlled by a company. Scope 3 emissions are associated with the emissions of activities a company does not own or cannot control.

11 *GHG Protocol* is an international standard for corporate accounting and reporting emissions. Emissions are categorized as Scope 1, 2, or 3 based on the source.

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➔ **Prioritize projects that align with the principles and guidance above by:**

- Designing solicitation criteria and project evaluation metrics in a manner consistent with these principles and guidelines and directing funding toward high-quality projects that optimize outcomes for people, nature, and climate.
- Prioritizing credits that have been certified by a recognized standard, verified by a third party, and are tracked in a transparent and publicly accessible registry.
- When interested in a project that is not in line with these principles and guidance, opening a dialogue with the project proponents to ascertain if there is a desire to move toward higher quality. If so, buyers and investors should determine how to support such progress and develop a mutual understanding of clear and measurable milestones toward improvement.

➔ **Adopt a long-term mindset.** High-quality blue carbon projects are a long-term endeavor that often entail years of investment and require high-integrity, long-term capital. Blue carbon projects require true long-term partnership and thinking. The most impactful buyers and investors are those who bring creativity and patience to their partnership with project developers and who recognize that carbon asset generation is not the end but rather the beginning of a long-term relationship between the project developer and community.

Investors, public and institutional funders, and philanthropists can effectively grow the supply of blue carbon credits by providing early-stage, risk-tolerant capital. The use of multiple streams of funding (e.g., blended finance) can help address short- and long-term funding needs because different types of funders have different appetites for risk and impact. Funders with a special interest in community and biodiversity outcomes can help drive the early stages of project development. New investors should apply these principles and guidance and update their investment thesis and carbon program key performance indicators (KPIs) to include community wellbeing, livelihoods, climate, and biodiversity outcomes.

Companies seeking to purchase carbon credits might consider supplying concessionary capital to help cover the transaction costs of project certification; this would address a major barrier to project development and thereby increase the supply of available credits in the near term. In-kind support in the form of technology, capacity, and influence can also advance blue carbon projects.

➔ **Consider cost, value, and quality when evaluating the price of blue carbon credits.** Blue carbon projects often deliver substantial co-benefits beyond climate change mitigation that add durability benefits and impact price. Restoration activities can increase upfront project development costs, leading to a higher cost per credit.

SUPPLIERS AND PROJECT DEVELOPERS

Suppliers and developers of blue carbon projects should:

- **Prioritize projects that align with the principles and guidance above.** Project developers should design request for proposal (RFP) criteria and project evaluation rubrics in a manner consistent with these guidelines to direct funding toward high-quality projects. Project developers should seek validation by a third party and publicly list a project on a registry.
- **Create a holistic budget** that accounts not only for the carbon dimension but also for community and ecological dimensions. Project developers and suppliers should understand the financial resources needed, and for what duration, to establish and maintain high-quality projects. Doing so will enable them to generate fairly priced blue carbon credits that generate enough net revenue to support long-term project success.
- **Invest in high-quality long-term relationships.** Suppliers and project developers should look for partners and investors who seek benefits beyond carbon and who value long-term outcomes that high-quality projects deliver for people, nature, and climate. They should also understand that carbon asset generation is not the end but the beginning of a long-term relationship with the community.

GOVERNMENTS

Timely and appropriate engagement of governments, at multilateral, national, and subnational levels, is key to planning for and implementing high-quality blue carbon projects. Through our research, we have identified several opportunities for governments to demonstrate leadership and enable the development of high-quality blue carbon projects within their respective jurisdictions.

Governments should:

- **Provide robust regulatory and policy frameworks** for the issuance and sale of blue carbon credits in international (or national) VCMs and align them with international frameworks.
- **Clarify ownership of land and carbon.** Blue carbon ecosystems are often on publicly owned and managed land. Government engagement, clear benefit-sharing policies, transparent consultation processes, and prior agreement with local and/or Indigenous communities should be well established and agreed upon as prerequisites for project planning and deployment. Governments should provide clear and reliable (i.e., guaranteed) commitments to communities about their resource rights, including their right to sell carbon and to accrue benefits from their sale.
- **Respect land tenure and rights.** Governments need to play a supportive and proactive role in respecting the rights of local communities and Indigenous Peoples and addressing uncertainties and disputes regarding land and resource (including carbon) ownership.
- **Accelerate public investment financing.** Governments can deploy development assistance financing at scale to grow the marketplace by underwriting the development of blue carbon projects that adhere to high-quality principles and that engage multilateral donors, philanthropies, impact investors, and the private sector through blended finance initiatives. Governments can also insure projects to reduce perceived risks arising in this nascent marketplace, thereby crowding-in additional investment from more risk-averse sectors.
- **Provide support for technical assistance.** Governments can provide much-needed support for building community, scientific, and technical capacity, particularly for small island developing states and coastal developing countries.
- **Clarify the implications of Article 6 and NDCs.** As governments tackle how to meet their NDCs and engage in cooperative approaches under Article 6 of the Paris Agreement, they should account for the benefits and challenges of the voluntary carbon market and engage with project investors, developers, and local communities to understand the impacts of various approaches and decisions.

CONCLUSION

Blue carbon offers a triple-benefit investment that is drawing significant interest among investors, sellers, and buyers who seek to build resilience, reduce biodiversity loss, and capture and sequester carbon. Its potential to mobilize climate and adaptation finance to support scaling blue carbon projects is growing. These projects could greatly benefit communities whose livelihoods and wellbeing are directly linked to that of blue carbon ecosystems and who face significant threats from climate change and biodiversity loss. In short, the benefits of blue carbon credits go far beyond reducing carbon emissions.

With this opportunity comes great responsibility. All involved should understand and implement high-quality blue carbon projects that deliver optimal outcomes for people, nature, and climate. Please join us in implementing and learning from the use of these principles and guidance to realize the full potential of blue carbon.

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APPENDIX A: SAMPLE QUESTIONS TO VET HIGH-QUALITY CREDITS

PRINCIPLE	SAMPLE QUESTIONS
 **Safeguard nature**	➔ Does this project mix conservation and restoration activities? What is the expected percentage in hectares and carbon volume? What are the interventions? ➔ If restoration is a component of the project, is the project developer following best practices for ecological restoration? ➔ How does this project define successful restoration? How does it measure progress and success?
 **Empower people**	➔ Did the project developer conduct and document free, prior, and informed consent before initiating any project development? ➔ Did the project developer conduct stakeholder mapping that took into consideration gender equity and power dynamics within the community? What are the results of this stakeholder mapping and how does the mapping inform the project design and proposed activities? ➔ How will different communities participate in project design, governance, and management? What are the respective roles of the various stakeholder groups, especially Indigenous Peoples and local communities, women, and other marginalized groups? What systems are in place to ensure the decision-making processes are fair, participatory, and transparent? ➔ What respective roles did the various stakeholders have in defining the benefit-sharing structure? At what point in the project development was the benefit-sharing structure defined and what kinds of agreements are in place to formalize the structure? How would it be monitored and governed going forward? Who has visibility into the benefit-sharing structure, project costs, and financial flows?
 **Employ the best information, interventions, and carbon accounting practices**	➔ Has the project developer done a blue carbon project feasibility study to determine feasibility against recognized methodologies? ➔ How will the project design and measurement, reporting, and verification approach account for the dynamic and highly connected nature of blue carbon ecosystems? ➔ What are the project's expected impacts on carbon, biodiversity, and livelihood? Which accepted standards and methodologies are used to quantify impact and how are they applied? ➔ How does local and Indigenous knowledge shape the project plans? ➔ What is the original cause for ecosystem degradation (e.g., conversion for other land uses or altered water flow) and what measures are being taken to remove this specific threat to ecosystem recovery and to ensure biophysical conditions are appropriate for recovery?

PRINCIPLE	SAMPLE QUESTIONS
 **Operate locally and contextually**	➔ How does the current policy, legal, and governance environment support successful development of this project? ➔ To what extent do multiple government agencies have overlapping or adjacent jurisdiction at the project site and how will this be managed? ➔ Has the project engaged the support of local resource agencies? Are their respective roles and benefits well understood and defined within the project plan? ➔ How does the government support land tenure for local communities and Indigenous Peoples? Do policies exist to define who owns land and carbon rights? ➔ What are the policy, legal, and/ or governance risks? How is the project developer actively addressing these risks?
 **Mobilize high-integrity capital**	➔ Has the company purchasing credits established an emissions reduction strategy and made commitments to reduce emissions internally that are consistent with international standards and based on the best available science? ➔ How does the investor demonstrate their commitment to ensuring the long-term financial viability of the project? ➔ What is the buyer's demand for emissions reductions credits and removals credits? ➔ Does the buyer or investor have programmatic goals pertaining to community wellbeing and environmental integrity? ➔ How are operational expenses and community benefits reflected in the agreed-upon price? What other funding sources, if any, are needed to ensure all expenses and incentives are covered?

APPENDIX B: GLOSSARY

Additionality: Ensures that the carbon credit project occurs outside of *enforced* mandated protections such as national laws, regulations, or other government policies. A project is additional if (1) it would not have taken place without the added incentive created by the carbon credit and (2) the benefits (including carbon sequestration) would not have been realized in the absence of the project.

Article 6: Section of the Paris Agreement that lays out principles for how countries can cooperate with each other to achieve their Nationally Determined Contributions emissions reduction targets. It enables countries to transfer carbon credits by establishing mechanisms for trading greenhouse gas emissions and further facilitates cooperation through finance, technology transfer, and capacity building. Negotiations for clarifying the modalities of implementation are ongoing.

Baseline: The projected level of greenhouse gas emissions in the absence of the carbon offset project.

Benefit sharing: Distributing monetary and nonmonetary benefits that are generated from the carbon offset project with local communities and stakeholders.

Blended finance: Strategic financing model that mobilizes commercial capital alongside development funding, reducing risk for private investors and attracting commercial capital toward sustainable development in developing countries.

Blue carbon: Carbon that is stored in coastal marine ecosystems including mangrove forests, seagrass meadows, and tidal salt marshes.

Corresponding adjustments: A rule in Article 6 of the Paris Agreement that aims to ensure countries do not double count (see next entry) carbon offsets when they are sold or transferred internationally. The details of corresponding adjustments and how to implement them will be decided through ongoing Article 6 negotiations.

Double counting: Counting greenhouse gas emissions reductions or removals more than once toward mitigation targets or goals. This can occur through double issuance (issuing multiple carbon credits toward the same emissions reduction or removal); double use (claiming a credit multiple times for achieving mitigation goals); and double claiming (claiming an emissions reduction or removal by multiple entities).

Ecosystem services: Ecological processes or functions that directly or indirectly contribute to human wellbeing. The four overarching classifications of such benefits are provisioning, regulating, cultural, and supporting services.

Gender: A social construct that encompasses the economic, political, and sociocultural attributes, constraints, and opportunities associated with identifying as a man, woman, gender nonbinary person, etc. As such, it varies across cultures and is dynamic and open to change over time.

Good governance: The principle that transparent and inclusive mechanisms are in place to support project development and management throughout the lifecycle of a credit.

Grievance mechanisms: A source for continuous learning in which groups affected by the project can identify concerns and harm and have issues adequately addressed, resolved, and avoided, in the future.

Free, prior, and informed consent (FPIC): A principle of international human rights standards that protects the right to self-determination. Accordingly, consent for an intervening project must be given in advance and based on information that is accurate, timely, complete, accessible, and appropriate.

High-quality blue carbon credit: A carbon credit derived from a high-quality blue carbon project that provides measurable emissions reductions or removals of greenhouse gasses through the conservation or restoration of coastal marine ecosystems (i.e. mangrove forests, seagrass meadows, and salt marshes). Emissions reductions and removals meet the standard criteria for carbon crediting (e.g., additionality and permanence).

High-quality blue carbon project: In addition to generating high-quality blue carbon credits, hgh-quality blue carbon projects deliver biodiversity, social, and economic benefits that often have more immediate relevance to local communities. Benefits for local and Indigenous communities, ecosystem ingetrigy, and biodiversity are integral elements of a high-quality blue carbon project. Carbon projects that provide measurable reductions or that prioritize these positive outcomes are (1) designed with participation from Indigenous Peoples and local communities, (2) adaptively managed, and (3) verified under established standards.

Land tenure: Property and natural resource rights of individuals or communities, protecting their access to and management of the land on which they reside and the resources they use.

Nature-based solutions: Actions to protect, conserve, restore, sustainably use, and manage natural or modified terrestrial, freshwater, coastal, and marine ecosystems to tackle socio-environmental challenges like climate change. These solutions address social, economic, and environmental challenges effectively and adaptively, while simultaneously providing human wellbeing, ecosystem services, resiliency, and biodiversity benefits.[12]

Permanence/durability: The assurance that emissions reductions or removals generated by a mitigation activity are not reversed over a certain time.

Transparent and accurate greenhouse gas accounting: Transparency in greenhouse gas accounting entails disclosing relevant assumptions, explaining methodologies, referencing data used, and presenting factual, coherent accounting information based on a clear audit trail. Accuracy references the precise, verifiable quantification of greenhouse gas emissions that enable others to make informed decisions with reasonable assurance of the integrity of carbon sequestration.

Voluntary carbon market (VCM): A marketplace for carbon credits that are not purchased for the purpose of meeting regulatory emissions requirements. Instead, they deliver independently verified and additional emissions reductions on a global scale.

12 "United Nations Environment Assembly Agrees Nature-Based Solutions Definition." Nature. Accessed June 16, 2022.

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APPENDIX C: TABLE OF EXISTING STANDARDS

This table lists standards used to certify blue carbon credits.

ACCREDITING AGENCY	STANDARD	METHODOLOGY	ECOSYSTEM	DETAILS
Verra	The Verified Carbon Standard[13]	VM0033 Methodology for Tidal Wetland and Seagrass Restoration	Mangrove forest Seagrass meadow Tidal salt marsh	➔ Achieve emissions reductions through increased biomass and soil carbon
		VM0007 REDD+ Methodology Framework (REDD+MF)	Tidal wetland Mangrove forest Forested wetland Forested peatland	➔ Reduce emissions from deforestation and forest degradation
	Community, Climate, and Biodiversity Standard (CCB)[14]			➔ Verifies social and biodiversity impacts of projects
Plan Vivo	Plan Vivo[15] Standard V5	CDM AR-AM0014 Afforestation and reforestation of degraded mangrove habitats or other methodology pre-approved by Plan Vivo	Mangrove forest Seagrass meadow Tidal salt marsh	➔ Includes rigorous guidelines to ensure that communities are prioritized in project design and implementation ➔ Requires a mandatory commitment to share a minimum of 60 percent of project revenues with communities and provide publicly accessible records of all community engagement processes ➔ Measurements for biodiversity outcomes are required ➔ May permit the use of International Panel on Climate Change default values or other peer-reviewed published data to be submitted for project carbon models ➔ Claims must be conservative estimates based on the cited data

13 "Verified Carbon Standard." Verra. Accessed September 9, 2022.

14 "Climate, Community, and Biodiversity Standards." Verra. Accessed September 9, 2022.

15 "Plan Vivo Standard 5.0." Plan Vivo. Accessed September 9, 2022.

ACCREDITING AGENCY	STANDARD	METHODOLOGY	ECOSYSTEM	DETAILS
American Carbon Registry	The Restoration of California Deltaic and Coastal Wetlands Methodology	Uses a Wetland Restoration Methodology Framework that can be adapted to project-specific methodology	Tidal salt marsh	
	The Mississippi Deltaic Wetland Restoration Methodology		Tidal salt marsh	
Climate Action Reserve			Wetland forest	➔ Methodologies have been developed in Spanish for forest and wetland forests in Mexico
The Gold Standard	Forest Methodology		Mangrove forest	
	Sustainable Mangrove Management (forthcoming late 2022)		Mangrove forest	

Currently, Verra's Verified Carbon Standard and Plan Vivo are the most frequently used standards for blue carbon projects. The Verra approach is scientifically rigorous and, when paired with the Community Climate and Biodiversity certification, accounts for non-carbon benefits for people and biodiversity. The Plan Vivo Standard is notable for its rigorous guidelines to ensure that must use engagement with and benefits for communities are prioritized. Projects seeking certification under the Plan Vivo Standard must apply methodologies approved by the Plan Vivo Foundation and demonstrate positive outcomes for biodiversity.

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APPENDIX D: RESEARCH METHODOLOGY

Preparation of this assessment of principles involved:

- Desk analysis of reports, case studies, and standards for both carbon credits and marine conservation;
- Interviews with stakeholders, including businesses, project developers, scientists, civil societies, and credit issuers;
- Synthesis of information into an overview of the current consensus regarding the quality and integrity principles in carbon markets and marine conservation;
- Identification of the unique considerations and opportunities for issuing high-quality credits for blue carbon; and,
- Identification of the gaps that need to be filled for blue carbon markets to be viable, scalable, and durable.

Each of the relevant works consulted was reviewed with respect to two sources to conduct a gap analysis: "What Makes a High-Quality Carbon Credit" by the World Wildlife Fund, Environmental Defense Fund, and the Oko-Institute, and "An Appeal for a Code of Conduct for Marine Conservation" (Bennett et al. 2017). Additional standards and principles were mapped against the criteria presented in these two reports to determine main consensus points, draw out important themes, and reveal gaps that need to be addressed. This exercise provided a framework to identify areas of alignment across various actors in the carbon market and revealed opportunities to incorporate knowledge about marine conservation principles to present a holistic vision for blue carbon.

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