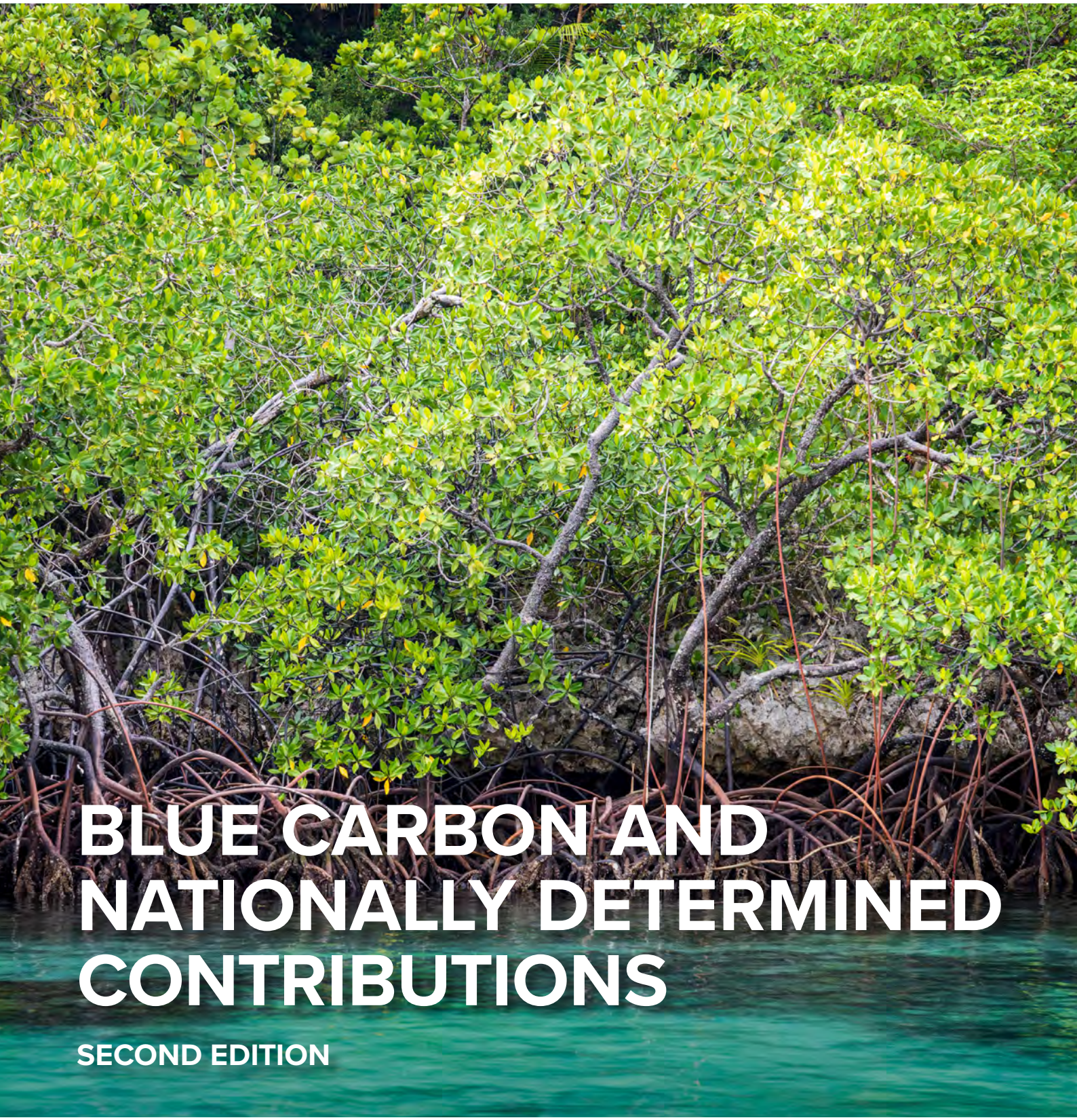

BLUE CARBON AND NATIONALLY DETERMINED CONTRIBUTIONS

SECOND EDITION

the BLUE CARBON initiative

Guidelines on Enhanced Action

A guide on how countries may include blue carbon in their Nationally Determined Contributions

JULY 2023

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Vivid seagrass. © Conservation International/photo by Paul Hilton; **COVER:** Mangroves in Raja Ampat, Indonesia. ©Jonathan Irish; **BACK COVER:** Hazy lake with birds in water. © Conservation International/photo by Keith A. Ellenbogen

EXECUTIVE SUMMARY FOR POLICYMAKERS

Fish swim among mangrove roots. © Seadam/Dreamstime

- Coastal wetland "blue carbon" ecosystems—mangroves, seagrasses and tidal marshes—sequester and store large quantities of carbon. In addition to climate mitigation benefits, these ecosystems provide a multitude of other values such as disaster risk reduction, climate adaptation, habitat for fisheries and biodiversity.

- IPCC GHG accounting guidelines currently only consider tidal marshes, mangroves and seagrasses to be actionable blue carbon ecosystems for mitigation. Emerging blue carbon ecosystems, including macroalgae (kelp), benthic sediments and mud flats show potential mitigation capacities but significant scientific uncertainties currently prevent their inclusion in GHG accounting.[1]

- Nature-based solutions (NbS),[2] including protection, conservation and restoration of blue carbon ecosystems, are an integral component to reaching the 1.5-degree Celsius objective laid out by the Paris Agreement.

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1 Rankovic, A., Jacquemont, J., Claudet, J., Lecerf, M. & Picourt, L. (2021). Protecting the ocean, mitigating climate change? State of the evidence and policy recommendations. Ocean & Climate Platform. Policy Brief. p.1–6. Available here.

2 The Fifth Session of the United Nations Environment Assembly (UNEA-5) in its 'Resolution on Nature-based Solutions for Supporting Sustainable Development' formally adopted the definition of NbS as 'actions to protect, conserve, restore, sustainably use and manage natural or modified terrestrial, freshwater, coastal and marine ecosystems, which address social, economic and environmental challenges effectively and adaptively, while simultaneously providing human well-being, ecosystem services and resilience and biodiversity benefits.'

- Countries with coastal wetlands can recognize the benefits provided by these ecosystems as a potentially significant contribution to both the mitigation and adaptation goals of their Nationally Determined Contributions (NDCs) to the Paris Agreement. These benefits are additional and complementary, not a substitute, to the critical need for countries to reduce their greenhouse gas emissions from other sectors such as energy and transport.

- NDCs can send clear, up-to-date and ambitious signals to the global community, outlining country priorities, capacity considerations and financing needs for successful implementation.

- Some 2015 NDCs identified protection or restoration of coastal wetlands and blue carbon ecosystems as part of their climate mitigation and/or adaptation plans with an increasing number of countries doing so in their 2020 NDCs. All countries with these ecosystems have the opportunity to strengthen or add new commitments in future ambition cycles.

- The ambition mechanism of the Paris Agreement, where NDCs can be updated, offers the opportunity for countries to increase ambition and improve resilience by enhancing the role of nature, including blue carbon ecosystems and NbS such as green-gray infrastructure, as a climate solution for mitigation and adaptation.

- Protecting, conserving and restoring blue carbon ecosystems as an action within NDCs is a multi-faceted process and will vary in form and application according to country circumstances. Opportunities exist for countries to increase the ambition of their NDC commitments to coastal wetlands in a stepwise fashion over time, through the “ratchet mechanism” of the Paris Agreement.

- These guidelines describe the merits of including coastal wetlands in NDCs at a variety of levels and how this can enhance the overall NDC ambition. Countries can use these guidelines to take incremental steps across levels toward including coastal wetlands in their NDCs.

- Given the multiple ways through which to include coastal wetlands in NDCs—including through adaptation or mitigation, and the associated different approaches, capabilities and available data across different countries—these guidelines present a“tiered approach” for the inclusion of coastal wetlands in NDCs. Having determined which engagement level is appropriate for a country, these guidelines then present five ‘Pillars’ as guidance.

- Comprehensively including blue carbon ecosystems in an NDC carbon accounting framework requires rigorous planning and robust capacities, an exercise best initiated through a “Blue Carbon Readiness” assessment. Some countries may have already undergone such an assessment and possess relevant capacities, while others will need time to develop them. In either case, countries can use their NDCs and the NDC trajectory to outline their current and intended future blue carbon actions.

- In their 2025 NDC update, Parties should describe how the outcomes of the Global Stocktake (GST) have informed their next or updated NDC, particularly areas that the GST highlights around the benefits of NbS and blue carbon ecosystems.

- The NDC Partnership is a coalition of more than 200 members, including more than 120 developed and developing countries, and more than 80 institutions, working together to create and deliver on ambitious climate action. Through the Partnership, countries draw upon members’ expertise, technical assistance and funding, turning their NDCs into actionable policies, programs and projects. Whether or not countries have the technical knowledge, opportunities exist for them to integrate blue carbon ecosystems into their NDC, including by requesting technical and financial support through the NDC Partnership.

- While successful NDC design and implementation should involve deep engagement with relevant communities, civil society and private sector actors, this is a task led by governments and their partners across departments and agencies. Staff within and working on behalf of government agencies are the intended primary audience for this guidance document.

Mangrove, Waigeo passage. © Conservation International/photo by Sterling Zumbrunn

INTRODUCTION

Countries with coastal wetlands can recognize the benefits provided by these ecosystems as a potentially significant contribution to both the mitigation and adaptation goals of their Nationally Determined Contributions (NDCs). These benefits are additional and complementary, not a substitute, to the critical need for countries to reduce their greenhouse gas emissions from other sectors such as energy and transport.

These guidelines describe the merits of including coastal wetlands in NDCs at a variety of levels and how doing so can enhance the overall NDC ambition. These guidelines support countries seeking to promote and preserve the climate benefits provided by these ecosystems by providing technical guidance on the multiple avenues by which coastal wetlands can be included within new and updated NDCs to the Paris Agreement, and can thus contribute to countries' raised ambition.

Coastal Blue Carbon Ecosystems

Coastal wetlands are some of the most productive ecosystems on Earth. They are home to a wealth of biodiversity and provide essential ecosystem services, such as coastal protection from storms and nursery grounds for fish.[3] Their role in sequestering and storing carbon from the atmosphere and the ocean is increasingly recognized by policymakers. Coastal blue carbon ecosystems provide a full spectrum of mitigation, adaptation and resilience benefits to address climate change. Additionally, these ecosystems provide coastal communities globally with fisheries, livelihoods and numerous cultural values.[4,5]

Why Nationally Determined Contributions?

NDCs represent the primary implementation mechanism of the Paris Agreement under the United Nations Framework Convention on Climate Change (UNFCCC), with each Party submitting progressively ambitious commitments over five- or ten-year cycles to achieve the Agreement's long-term goals (Article 4.3).

This "ratchet mechanism" or "ambition mechanism" ensures continued enhancements over time, measured through "stocktake" exercises conducted between NDC submissions (see Figure 1). NDCs are not intended to solely represent reiterations of existing national strategies and plans. Instead, NDCs allow governments to express, give direction and clearly state their future ambitions to address climate change.

While conceived principally as mitigation instruments, in practice many Parties have understood NDCs to define a country's specific climate change commitments in the broader sense, covering mitigation, adaptation and resilience priorities. This flexibility in the NDC architecture is at the core of what is often referred to as the "bottom-up" approach of the Paris Agreement, whereby each country defines the nature of their targets, the scope of their commitments and the details of implementation specific to their NDC.

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3 Barbier, E.B., Hacker, S.D., Kennedy, C., Koch, E.W., Stier, A.C. and Silliman, B.R. (2011), The value of estuarine and coastal ecosystem services. Ecological Monographs, 81: 169-193. https://doi.org/10.1890/10-1510.1

4 Amber Himes-Cornell, Linwood Pendleton, Perla Atiyah. (2018), Valuing ecosystem services from blue forests: A systematic review of the valuation of salt marshes, seagrass beds and mangrove forests. Ecosystem Services, Volume 30, Part A, Pages 36-48, ISSN 2212-0416, https://doi.org/10.1016/j.ecoser.2018.01.006

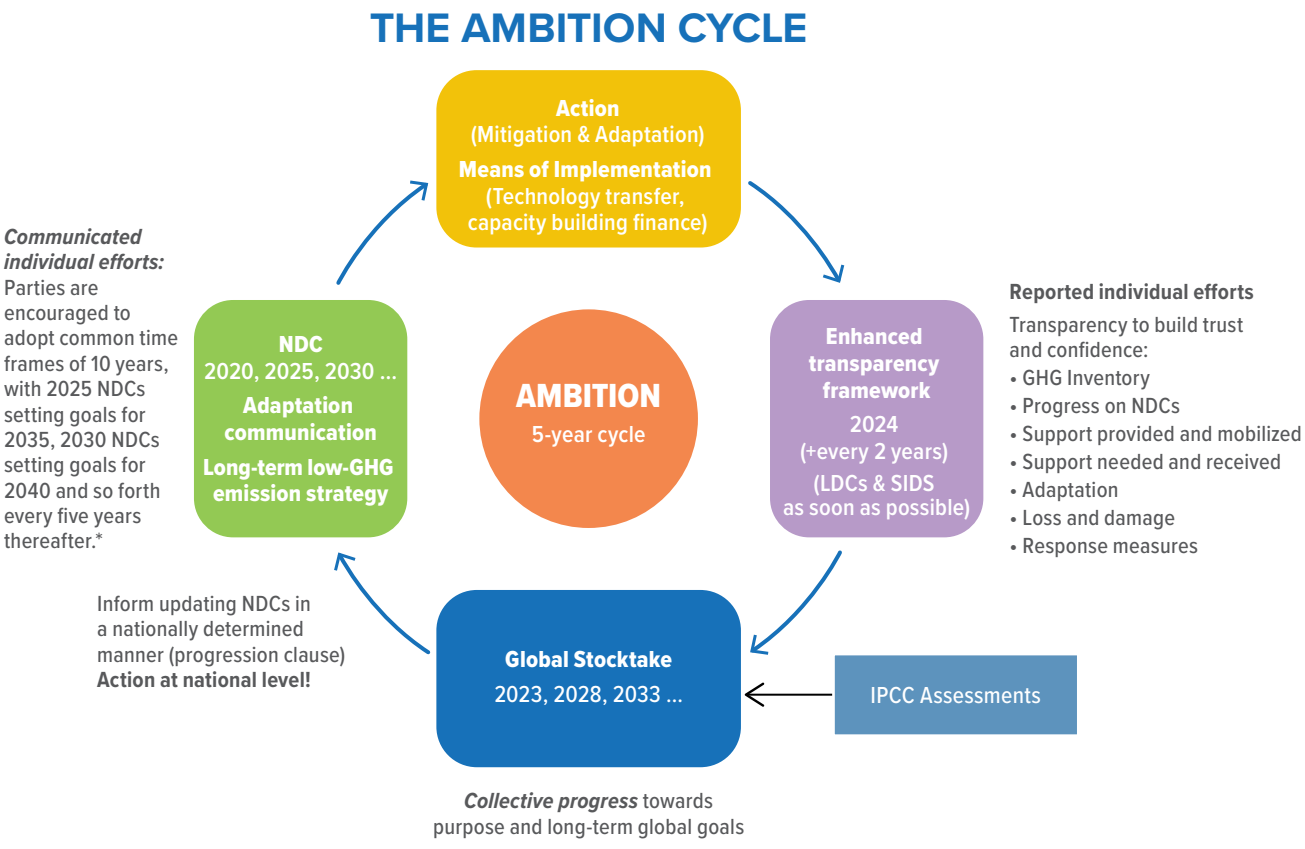
5 Mcleod, E., Chmura, G.L., Bouillon, S., Salm, R., Björk, M., Duarte, C.M., Lovelock, C.E., Schlesinger, W.H. and Silliman, B.R. (2011), A blueprint for blue carbon: toward an improved understanding of the role of vegetated coastal habitats in sequestering CO2. Frontiers in Ecology and the Environment, 9: 552-560. https://doi.org/10.1890/110004

While the principal aim of these guidelines is to provide a framework for the inclusion of coastal wetlands into NDCs, the approaches described also have application to other parallel climate instruments, in particular, national Greenhouse Gas (GHG) inventories. Integration into the national GHG inventory is a useful step for blue carbon to be included in NDC mitigation targets and a necessary step for GHG accounting of the sector.

The number of NDCs now recognizing coastal wetlands in relation to their mitigation potential has increased since the first round of NDC submissions in 2016. A total of 151 countries around the world contain at least one coastal wetland ecosystem, and 71 countries contain all three.[6] However, only about half of all the countries that have blue carbon ecosystems included coastal and marine NbS in their initial NDC. Among the 71 countries with all three blue carbon ecosystems, 45 included coastal and marine NbS for both mitigation and adaptation purposes, 1 for mitigation only and 25 for adaptation only.[7]

Protection of coastal wetland ecosystems is one example of how a country may include blue carbon ecosystems in their NDC. Protection of coastal wetlands can reduce emissions from their degradation or conversion. In addition to the carbon emissions, the degradation and destruction of coastal wetlands can severely impact the capacity of coastal communities globally to adapt to climate change-related extreme weather events and sea level rise. Conservation, protection, restoration and sustainable management of these important ecosystems are therefore valuable climate actions.

FIGURE 1: The Ambition Cycle under the Paris Agreement (Source: based on information/presentations by the UNFCCC secretariat, with special thanks to Joanna Post).



** CTF Decision 2, paragraph 2.*

6 Herr, D. and Landis, E. (2016). Coastal blue carbon ecosystems. Opportunities for Nationally Determined Contributions. Policy Brief. Gland, Switzerland: IUCN and Washington, DC, USA: TNC.

7 Lecerf, M., Herr D., Thomas, T., Elverum, C., Delrieu, E. and Picourt, L., (2021), Coastal and marine ecosystems as Nature-based Solutions in new or updated Nationally Determined Contributions, Ocean & Climate Platform, Conservation International, IUCN, GIZ, Rare, The Nature Conservancy, Wetlands International and WWF.

Motivations and Co-Benefits of Including Coastal Wetlands in NDCs

Political awareness of the climate values of coastal wetlands and other NbS has developed considerably since the initial and updated NDCs were submitted.[8] The specific motivations for the inclusion of coastal wetlands in NDCs will vary between countries and can include:

- **HIGH MITIGATION BENEFITS.** Coastal wetlands sequester carbon at higher rates, per unit area, than terrestrial forests, storing the carbon within both their biomass (leaves, roots, wood and stems) and carbon-rich organic soils.[9] The global area covered by blue carbon ecosystems is equivalent to only 1.5% of terrestrial forest cover. However, their loss and degradation are equivalent to as much as 19% of CO_2 emissions from terrestrial deforestation because of their high carbon stocks per hectare.[10]

- **HIGH ADAPTATION BENEFITS.** Coastal wetlands provide essential services for climate change adaptation, including protection from storm surges, flooding, sea-level rise and coastal erosion.[11] Investment in these forms of "green infrastructure",[12] such as living coastlines, provides other essential ecosystem services such as food security, local livelihoods (small-scale fisheries) and biodiversity protection. Coastal wetlands are often more cost-effective than "gray infrastructure," such as seawalls and breakwaters.[13]

- **SUSTAINABLE BLUE ECONOMY.** Many countries have expressed interest in developing and maintaining sustainable blue coastal and ocean economies.[14] There is an opportunity for these governments and the private sector to work closely with coastal communities to align direct benefits with better management and protection of the ocean. Commitments to the conservation of blue carbon ecosystems also serve as a signal to multiple potential avenues for financial support and development of blue economies. Achieving a sustainable blue economy implies a model that promotes investment, stimulates coastal development, improves the quality of life and guarantees a healthy and resilient ocean.

- **BUILDING RESILIENCE.** The collective benefits that communities receive from adaptation and mitigation benefits provided by these ecosystems, as well as strengthened economies, contribute to building the resilience of communities. Green-gray or hybrid infrastructure solutions that blend ecosystem conservation and restoration while selectively applying conventional engineering approaches can further bolster the resilience of coastal communities to climate change.[15]

- **NDC PROGRESSION.** The Paris Agreement encourages countries to move towards economy-wide mitigation targets, ultimately covering all economic sectors and emissions sources.[16] The integration of land sector emissions, including those from coastal wetlands, is a major milestone on this path.

- **CLIMATE FINANCE.** In Paris during COP 21, countries agreed that developed countries would continue their existing collective finance goal—mobilizing US$100 billion annually from public and private sources—through 2025. Within ongoing negotiations and processes related to climate finance, including the Ad hoc Work Programme on the New Collective Quantified Goal on Climate Finance, the Standing Committee on Finance, COP guidance for the Green Climate Fund and Global

8 The NDC Partnership—a coalition designed to help countries create and deliver on ambitious climate action that helps achieve the Paris Agreement and SDGs—received 264 requests for support from 33 countries, between October 2017 and February 2023, related to 'oceans & coasts' for their NDC Implementation Plans. This is up from 112 requests from 22 countries reported in the previous version of this publication.

9 Mcleod, E., Chmura, G.L., Bouillon, S., Salm, R., Björk, M., Duarte, C.M., Lovelock, C.E., Schlesinger, W.H. and Silliman, B.R. (2011), A blueprint for blue carbon: toward an improved understanding of the role of vegetated coastal habitats in sequestering CO2. Frontiers in Ecology and the Environment, 9: 552-560. https://doi.org/10.1890/110004

10 Pendleton et al (2012), Estimating Global "Blue Carbon" Emissions from Conversion and Degradation of Vegetated Coastal Ecosystems. PLOS ONE.

11 Duarte, C. et al (2013). The role of coastal plant communities for climate change mitigation and adaptation. Nature Climate Change, 3 (961–968).

12 Thiele, T. et al (2020). Blue Infrastructure Finance. A new approach integrating Nature-based Solutions for coastal resilience (IUCN).

13 Thiele, T., Alleng, G., Biermann, A., Corwin, E., Crooks, S., Fieldhouse, P., Herr, D., Matthews, N., Roth, N., Shrivastava, A., von Unger, M. and Zeitlberger, J. (2020). Blue Infrastructure Finance: A new approach, integrating Nature-based Solutions for coastal resilience. IUCN, Gland, Switzerland.

14 E.g. High Level Panel for Sustainable Ocean Economy www.oceanpanel.org

15 Felson, A. et al (2020). Practical Guide to Implementing Green-Gray Infrastructure, Green-Gray Community of Practice, p. 8.

16 Paris Agreement (2015), Article 4.3 and 4.4.

Environment Facility and the Adaptation Fund, working to increase and mobilize finance flows for coastal and marine NbS, including coastal wetlands, is critical.

NDCs are one of many entry points for securing climate finance to support blue carbon related actions. Under the provisions of the Katowice Climate Package concerning climate finance reporting, both the donor and the recipient country must report how a particular financial support or flow contributes to the achievement of the recipient country's NDC. Including the protection of coastal wetlands within an NDC is therefore an important staging post for a variety of potential climate funds.

Countries can access increased efforts to accelerate climate finance flows to coastal and marine ecosystems through various sources including—public and private, market and non-market financing programs and projects dedicated to coastal and marine NbS.

→ **CARBON MARKETS.** 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 can be 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 US$1 billion annually[17] and is projected to increase by a factor of 15 by 2030 and by 100 by 2050.[18]

There is a growing demand for carbon credits from a variety of voluntary and compliance markets that may present an opportunity to finance the protection, restoration and management of blue carbon ecosystems. Article 6 of the Paris Agreement establishes a broad framework for voluntary cooperation among Parties in delivering climate action through market and non-market approaches. As per the final guidance for international cooperation under Article 6, which was finalized in 2021 at COP26 in Glasgow, this market is open to credits from all sectors as long as these meet the main criteria and requirements set forth in the guidelines. While further technical work is ongoing to finalize technical aspects, this market could present an opportunity in the future for countries interested in selling blue carbon credits internationally, thereby accessing additional sources of finance.

These Guidelines

This document has been updated from the initial 2020 publication with additional case studies and recommendations incorporated from the 2020 NDC update cycle, looking forward towards the 2025 NDC update cycle and beyond.

Given the multiple and varied mechanisms to include coastal wetlands in NDCs, as well as the different approaches, capabilities and available data across different countries—these guidelines present a "tiered approach" for the inclusion of coastal wetlands in NDCs.

This is similar to that employed by IPCC guidance, to demonstrate how a variety of starting points and motivations all represent viable pathways. These have been outlined as a 'Tier' level depending on the stage of the country, and then 'Pillars' that align to sections within an NDC. The five central pillars include:

1. Readiness Assessment and Options for Including Blue Carbon in an NDC
2. Adaptation: Blue Carbon in the Adaptation Component[19] of an NDC
3. Mitigation: Blue Carbon and Mitigation Targets
4. Greenhouse Gas (GHG) Reporting and Inventories for Blue Carbon
5. Implementation: Delivering on Blue Carbon NDCs

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17 Forest Trends' Ecosystem Marketplace (2021). 'Market in Motion', State of Voluntary Carbon Markets 2021, Installment 1. Washington DC: Forest Trends Association.

18 Blaufelder, C., Levy, C., Mannion, P. and Pinner, D. (2021). A blueprint for scaling voluntary carbon markets to meet the climate challenge. McKinsey.com

19 Adaptation communications can be part of NDC but not necessarily—the Adaptation communication is mandated in such a way that it can be given as an integral part of the NDC or through a national communications, NAP, or transparency report.

Within this document the term “guidelines” refers to practices recommended by the authors. Unless specifically stated, it does not refer to guidance as adopted within the formal decision-making process of the UNFCCC and the Paris Agreement or guidance from the IPCC. While recognizing the important role of adaptation as an entry point for many countries, this guide focuses mainly on mitigation.

International Policy Context

In addition to NDCs, these guidelines can also support the development of coastal wetland commitments and actions under other relevant international policy processes such as those under the Convention on Biological Diversity (CBD), the 2030 Agenda and Sustainable Development Goals (SDGs) (in particular SDG 14—Life Below Water) and the Ramsar Convention on Wetlands of International Importance. Shifting from traditionally siloed approaches to integrated approaches across these international policy processes holds the potential to enhance ambition, accelerate implementation and deliver high-quality outcomes for coastal wetlands and the people that directly depend on them.

In particular, countries may wish to align NDC commitments with National Biodiversity Strategies and Action Plans (NBSAPs) under the CBD’s newly adopted Kunming-Montreal Global Biodiversity Framework (GBF). Coastal wetland conservation and restoration can help achieve Targets 1 (Spatial Planning and Land Use), 2 (Restoration), 3 (Conservation), 8 (Climate Change) and 11 (Nature’s Contributions for People) of the GBF, and enhanced coordination and alignment across these two commitments can help to build efficiencies and reduce strain on limited national capacity.[20]

Strengthening Ocean-Based Climate Action

Since COP25 in 2019 held under the Chilean Presidency in Madrid—the “Blue COP”—there has been increased awareness and interest in strengthening the inclusion of coastal and marine ecosystems in ongoing UNFCCC processes and negotiations, including coastal blue carbon ecosystems. At COP26 (2021) in Glasgow, Parties requested that the Chair of the Subsidiary Body for Scientific and Technological Advice (SBSTA) hold an annual dialogue to strengthen ocean-based action, the first of which focused on strengthening and integrating ocean-climate action in the context of the UNFCCC, including implementing the Paris Agreement, and enabling ocean and climate solutions through finance and capacity building. At COP27 in Sharm El-Sheikh, countries gave further structure to the annual Ocean and Climate Change Dialogue, structuring each Dialogue with two co-facilitators, selected by Parties biennially.

The Ocean and Climate Change Dialogue series is intended to be an action-oriented space where countries can discuss and develop concrete steps within the UNFCCC relevant processes and ongoing negotiations to fill gaps, build capacity and strengthen ocean-based climate action. The 2023 Dialogue focused on coastal ecosystem restoration, including blue carbon ecosystems, and future Dialogues could deepen these conversations to explore strategies for countries to enhance ambition, secure financing and support science and implementation efforts for blue carbon conservation and restoration under the UNFCCC and national policies.

20 Picourt, L., Lecerf, M., Goyet, S., Gaill, F., Cuvelier, R. & Parmentier, R. (2021), Swimming the talk: How to strengthen collaboration and synergies between the Climate and Biodiversity Conventions?, Policy brief, May 2021, OCEAN & CLIMATE PLATFORM, p.1–14.

Salt marshes, California, USA. © Keith A. Ellenbogen

USING THESE GUIDELINES

1. Who should use these guidelines?

While successful NDC design and implementation should involve deep engagement with relevant communities, civil society and private sector actors, these guidelines are primarily designed for national policymakers and technical experts directly involved in NDC design and implementation. This includes GHG inventory and accounting experts. The guidance should be applied in collaboration with other national priorities including those designed to meet climate adaptation and economic objectives, such as coastal and ocean resource management, and coastal wetland and biodiversity conservation.

These guidelines are designed to support all 151 countries that contain coastal wetlands, irrespective of their level of economic development and regardless of the type and nature of the country's NDC commitments.

2. Which aspects of these guidelines are relevant to my country

There is no 'one-size-fits-all' NDC. An NDC for an industrialized country, such as Australia, will be different to an NDC for that of a Small Island Developing State (SIDS), such as Fiji. NDCs are, by definition, determined by the individual countries with the common goals described in the Paris Agreement as tools of incremental change. The Paris Agreement states in Article 4.3:

> *Each Party's successive nationally determined contribution will represent a progression beyond the Party's then current nationally determined contribution and reflect its highest possible ambition, reflecting its common but differentiated responsibilities and respective capabilities, in the light of different national circumstances.*

Particular differences between countries will also include national reporting systems associated with NDCs, notably GHG inventories. Some countries have comprehensive data on emissions and removals from coastal wetlands while others do not. Reporting and planning capacities also vary between countries.

Thus, NDCs do not need to reflect a completely uniform blue carbon accounting framework or set of targets. Rather, they offer the opportunity for each country to move towards increasingly comprehensive coverage and targets for their blue carbon ecosystems over time, as relevant to country-specific contexts, and aligned with the types of information necessary for clarity, transparency and understanding.

3. Where to start?

There are specific actions for including blue carbon ecosystems in NDCs available to all countries. This guidance offers a tiered approach, represented by engagement levels for the inclusion of coastal wetlands in NDCs, similar to that employed by the IPCC Wetlands Supplement.[21] This tiered approach

21 Hiraishi, T., Krug, T., Tanabe, K., Srivastava, N., Baasansuren, J., Fukuda, M. and Troxler, T.G. (eds). (2014). 2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands, IPCC, Switzerland. https://www.ipcc.ch/publication/2013-supplement-to-the-2006-ipcc-guidelines-for-national-greenhouse-gas-inventories-wetlands/

accounts for the varying starting points, motivations, data and capacity levels among countries, as well as reflecting the broader stepwise nature of designing NDCs. Countries can identify their desired entry point and engagement level for including blue carbon ecosystems and follow the guidance accordingly.

Depending on data availability and institutional capacity (broadly grouped as high; medium; low) for any given country, these guidelines present tiered suggestions as follows: Engagement Level 1 (i.e., initial actions); Engagement Level 2 (i.e., supplemental actions); and Engagement Level 3 (i.e., fully comprehensive actions).

Countries can use these guidelines to take incremental steps across levels toward fully including coastal wetlands in their NDCs. (See Table 1).

Salt marshes in Duxbury, Massachusetts, USA. © Conservation International/photo by Sarah Hoyt

TABLE 1. Country engagement levels to fully include coastal wetlands in NDCs.	
Engagement Level*	**Example Status of Blue Carbon Data in Country**
* *Considerations for how coastal wetlands might be included within NDCs include:* • *Data completeness, existing capacities and clear identification of drivers (or origins) of ecosystem degradation or loss and associated mitigation values within GHG inventories.* • *Intra-governmental and policy coordination given the breadth of policies and government institutions and departments often involved in management of coastal wetlands.* • *Funding and capacity implications of implementation.*	
Level 1	• No data available on coastal wetland area, change or associated GHG emissions; and/or • Coastal wetlands are not included in any conceptual document on adaptation; and/or • Coastal wetlands are identified for inclusion in the national plan.
Level 2	• Coastal wetlands included in adaptation component of NDC or other adaptation communication; and/or • Some advances towards quantifying mitigation value of coastal wetlands using IPCC guidance,[22] including as part of a mitigation approach or implementation plan; and/or • Progressing towards/currently using at least IPCC "tier 1" based GHG inventory reporting for coastal wetlands.
Level 3	• Comprehensive IPCC "tier 2" (ideally, tier 3) based inventory reporting for coastal wetlands. • Blue carbon solutions are a key component of adaptation and/or mitigation commitments.

4. The Five Pillars

Having determined which engagement level is appropriate for your country (Table 1), these guidelines present the following five 'Pillars'. These pillars align to sections within an NDC where blue carbon can be included, and can be followed as a step-by-step process. Alternatively, countries can refer to individual pillars to provide them with guidance under the specific area of interest within sections of their NDC. The First Pillar (Readiness Assessment) provides a good starting point for any country looking to include blue carbon in their NDC.

1. Readiness Assessment and Options for Including Coastal Wetlands in NDCs
2. Adaptation: Blue Carbon in the Adaptation[23] Component of an NDC
3. Mitigation: Blue Carbon and Mitigation Targets
4. Greenhouse Gas (GHG) Reporting and Inventories for Blue Carbon
5. Implementation: Delivering on Blue Carbon NDCs

22 IPCC 1996 or 2006, but not yet incorporating the IPCC Wetlands Supplement, and addressing options for realizing this value (e.g., through an action or implementation plan).

23 Adaptation communications can be part of NDC but not necessarily—the Adaptation communication is mandated in such a way that it can be given as an integral part of the NDC or through a national communications, NAP, or transparency report.

A view of mangroves within Los Haitises National Park, Dominican Republic. © Olivier Langrand

FIRST PILLAR

Readiness Assessment & Options for Including Coastal Wetlands in NDCs

This pillar provides guidance to identify entry points for inclusion of coastal wetlands and blue carbon values in NDCs and how to identify the required data to develop ambitious, but realistic, targets for these commitments.

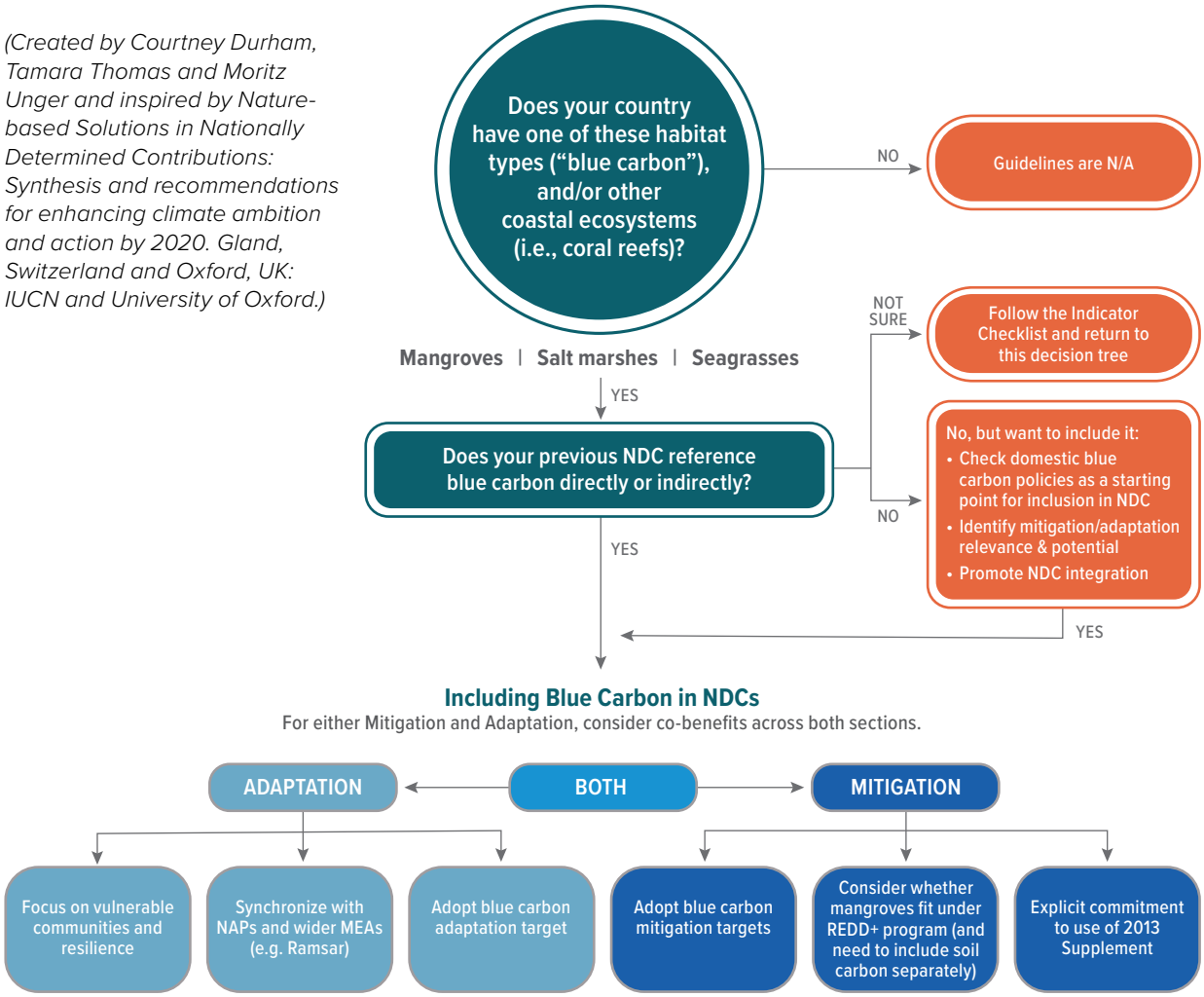
While the variety of legitimate entry points for including coastal wetlands within an NDC can accommodate variation amongst Parties' motivations and capacity, it can also potentially be confusing. It is very possible that integration of blue carbon into an NDC will span multiple sections of the document.

For example, a country may choose to: focus within the adaptation section on a qualitative description of the values provided by one or a multitude of blue carbon ecosystems, or opt for dual targets in both the adaptation and mitigation sections for only a single blue carbon habitat type (e.g., mangroves).

Alternatively, a country may commit to comprehensive quantitative accounting in GHG inventories for blue carbon broadly. The decision-tree below poses a series of questions to determine where coastal wetlands can feature within an NDC (see Figure 2).

FIGURE 2. Decision tree: Determining where coastal wetlands can be included within an NDC.

(Created by Courtney Durham, Tamara Thomas and Moritz Unger and inspired by Nature-based Solutions in Nationally Determined Contributions: Synthesis and recommendations for enhancing climate ambition and action by 2020. Gland, Switzerland and Oxford, UK: IUCN and University of Oxford.)



Readiness-Assessment

Once a Party has established the broader motivation to include coastal wetlands in its NDC, it can conduct a "readiness-assessment"—as further described in Appendix 1—to identify the best starting point. This is a technical exercise led by policy-makers to identify the opportunities for including coastal wetlands within the policy architecture and capacity levels of their existing climate frameworks. This exercise is a significant undertaking, with integral implications for a country's NDC, and may span multiple years or be implemented as a continuous cycle. Box 1 below illustrates the kind of questions that will be relevant to the readiness assessment exercise.

A readiness-assessment can be undertaken by any interested Party. It is not conditional on the completion of needs assessments for adaptation or available inventory data for mitigation. Rather, it is meant as the first step towards validated GHG emissions scenarios or mitigation/adaptation pathway assessments. This is also a first step toward assessing the more appropriate pathway for the inclusion of coastal wetlands/ blue carbon ecosystems relative to a country's domestic circumstance. It entails an investigation into quantitative data (including current and projected emissions) and qualitative data. The investigation into drivers of, and impacts on, degradation or land use/land cover change and into available policy and institutional formats will take center stage. If one lacks an understanding of drivers, impact and viable response measures, it is difficult to set precise targets within an NDC. However, any such gap in knowledge should not prevent a Party from addressing blue carbon in their NDC in the first place. On the contrary, the commitment to comprehensive accounting (now or in the future) and the assurance to research the missing data and to develop bespoke targets and implementation formats (in line with Engagement Level 1 and Engagement Level 2, see Table 2 below) are essential to set the stage for addressing blue carbon in an NDC.

Green sea turtle (*Chelonia mydas*). © Luciano Candisani/iLCP

BOX 1. Example checklist questions for identifying existing and potential entry points for coastal wetlands into NDCs.

- ☐ Does the national definition of forests include mangroves?
  - – If yes, does it include mangrove of all heights? (i.e., dwarf mangroves)
  - – If not, determine what heights are included in the definition.
  - – Other blue carbon ecosystems or mangroves not counted as forests could be accounted for as wetlands (or other relevant LULUCF line) in the national GHG inventory.
- ☐ Does the GHG inventory include blue carbon data?
  - – If yes, in what line item?
  - – If no, could it be included?
- ☐ Does the forest reference level include blue carbon ecosystems (e.g., mangroves)?
  - – If yes, how?
  - – If no, could it be included?
- ☐ Does the forest reference level account for soil organic carbon?
  - – If yes, how?
  - – If no, could it be included?

There may be existing indicators in previous NDCs that can help you situate future blue carbon inclusions and/or elaborations. In some cases, they may be apparent and in others they may be ambiguous. Examples include:

- **Clear Indicators**
  - – NDC references to the IPCC Wetlands Supplement
  - – NDC refers to “blue carbon”
  - – NDC refers to “coastal wetlands”
  - – NDC refers to “mangroves” and/or “salt marshes” and/or “seagrasses”
  - – NDC refers to “coastal” or “marine” ecosystems or habitats
  - – NDC refers to coastal risks from flooding, sea-level rise, or other
- **Ambiguous Indicators**
  - – NDC includes “AFOLU” or “LULUCF” in its scope
  - – NDC references REDD+
  - – NDC references ocean or MPAs along coasts
  - – NDC references wetlands generally

The questions in Box 1, drawn from the readiness assessment in Appendix A, will allow interested Parties to identify potential entry points, policy frameworks, or data gaps to include coastal wetlands in their NDCs. Throughout the readiness process, gaps that are identified—including data, capacity or domestic policy frameworks—should not be regarded as an obstacle to the objective of including blue carbon values into NDCs. Rather, a readiness assessment helps identify the appropriate entry point and therefore highlight country support needs and improvements for blue carbon inclusion in future NDCs within the five yearly “ambition cycle” of the Paris Agreement. Usefully, the ambition cycle provides opportunities to include or improve commitments and targets in NDCs, including for the blue carbon elements. Additionally, countries can choose to update their NDCs at any time within an “NDC cycle”.

Table 2 on the following page presents additional conditions to guide the inclusion of blue carbon ecosystems in an NDC based on a country’s engagement levels (see Section 3 ‘*Where to Start*’ for definitions of each engagement level). Since a full blue carbon readiness assessment may take multiple years and may even become a continuous exercise, it is important to keep in mind that it does not need to be complete for a country to address coastal wetlands in its NDCs. While the readiness assessment is taking place, a country may engage at Level 1 or Level 2.

TABLE 2. Scenarios to include Blue Carbon in NDCs.

Condition	Engagement Level
Existence of blue carbon ecosystems in the country; likely or potential role for coastal wetlands for mitigation or adaptation unclear	**Engagement Level 1** • Use the decision tree (Figure 2) to perform a quick evaluation of how your country has included or will include blue carbon in its NDC • Undertake a commitment to include a measurable blue carbon mitigation and/or adaptation target by 2025
Institutional arrangements for coastal wetlands are uncertain or conflicted	**Engagement Level 2** • Focus on implementation and governance basics (see Pillar 5) • Consider planning for harmonized regulatory and legal frameworks to allow for implementation • Consider defining cross-government blue carbon ecosystem conservation and restoration targets (mitigation and adaptation)
Institutional arrangements for coastal wetlands are clear	**Engagement Level 3** • Focus on implementation (see Pillar 5) • Design tailored policies, instruments and initiatives to advance conservation, restoration and/or sustainable management of blue carbon ecosystems for mitigation and adaptation.
Data gaps: Ecosystem extent and carbon stocks (partially) unknown	**Engagement Level 1–2** • Use the decision tree (Figure 2) to perform a quick evaluation of how your country has included or will include blue carbon ecosystems in its NDC • Undertake a commitment to include a measurable blue carbon mitigation and/or adaptation target by 2025 • Focus on blue carbon related GHG inventories and the gathering of field data to facilitate assessments and inventories • Consult records and reporting for other policy mechanisms (including Ramsar) and international research platforms (for details see Pillar 5) • Commit to the usage of the IPCC Wetlands Supplement for GHG inventories (see Pillar 4) in a future NDC (by 2025 or from 2025)
Data gaps: Ecosystem extent known, but specific carbon stock assessments missing	**Engagement Level 2** • Focus on inventories and apply default values (see Pillar 4) while national factors are being developed • Define coastal wetlands as falling within the NDC scope as of 2025 • Focus on gathering field data
Data gaps: Ecosystem extent known and carbon stock data available, but country-wide projections of change are unclear	**Engagement Level 2** • Focus on formulating implementation targets for specific areas and ecosystems only (e.g., existing or planned MPAs), within the context of mitigation and/or adaptation • Focus on mapping historical land use/land cover change dynamics based on consistent remote sensing and GIS analyses to anticipate potential future conditions

Data gaps: Drivers of degradation and loss are not well understood; regulatory impact unclear	**Engagement Level 2** • Build historical land use/land cover models based on a set of variables related to drivers of degradation and loss • Formulate tentative implementation targets (mitigation/adaptation) for blue carbon ecosystems only
Data gaps: Drivers of degradation and loss are well understood, but regulatory and governance framework are not adequately understood	**Engagement Level 2–3** • Focus on implementation and governance basics (see above) • Consider planning for a harmonized legal basis and/or ecosystem-specific institutional cooperation
Drivers of degradation and loss are well understood, and regulatory and land tenure gaps identified	**Engagement Level 3** • Extrapolate ambitious and achievable targets for mitigation and adaptation (see Pillars 2 and 3) • Identify instruments of implementation

Mangroves in Kenya. © WhiteRhino/IUCN ESARO

Sea grass on ocean floor, Indonesia. © Burt Jones and Maurine Shimlock

SECOND PILLAR

Adaptation: Blue Carbon in the Adaptation Component of an NDC

Given the increasing relevance of blue carbon ecosystems for coastal adaptation and resilience in a large number of countries, which in many cases far exceeds any mitigation potential, governments may first opt to acknowledge the adaptation benefits coastal wetlands provide in their NDC. This can be a valuable exercise in not only recognizing these values, but also a potential stepping stone in gathering the kind of information necessary to inform more in-depth mitigation assessments and even go beyond in recognizing and promoting synergies between mitigation and adaptation.

Blue carbon ecosystems provide a range of benefits for communities adapting to climate change, including improved protection from storm surges, flooding, sea-level rise and coastal erosion.[24] Mangroves for example, have dense roots that reduce the energy and height of waves and storm surges, protecting coastal infrastructure and communities from storm damages. Salt marshes provide essential flood abatement in low lying coastal areas and seagrasses control sediment and improve water quality. The benefits of protecting, restoring and sustainably managing coastal ecosystems also ensure that other essential ecosystem services like food security, biodiversity and local livelihoods from small-scale fisheries or tourism are protected. Blue carbon ecosystems can provide even stronger coastal protection benefits when combined with conventional engineering approaches. These hybrid NbS "green–gray infrastructure" approaches conserve and/or restore ecosystems while simultaneously and selectively applying conventional engineering techniques. This approach can provide increased protection to communities facing extreme climate risks in a more cost-effective and longer-lasting way than gray or green approaches alone.

Given the national context of adaptation needs and actions, a country has more flexibility in the structure of the NDC language and relevant components around adaptation than in the mitigation section. The adaptation section of an NDC could include a qualitative statement of "why" coastal wetlands are important and "how" these values are being/will be protected, such as an outline of certain policy commitments.

Alternatively, the adaptation section could consider existing adaptation policy instruments such as the Adaptation Communication (AC) or National Adaptation Plan (NAP) as a supplement. In addition, adaptation can be included throughout the NDC document, as is the case with Costa Rica's NDC, where adaptation contributions related to capacity building, monitoring, finance instruments, NbS and infrastructure and public services are included across the NDC's 13 "lines of action".

For some countries, this will be an opportunity to communicate policies, institutional arrangements and frameworks already in use and to align the NDC process with both international and domestic policy frameworks and domestic policy architecture such as Coastal Zone Management plans. Synchronizing key priority sectors and activities like the protection, restoration and sustainable management of coastal ecosystems in the NAP, AC and/or NDC, demonstrates that these actions are critical to support the countries' climate adaptation efforts and to achieve the Sustainable Development Goals and the Global Biodiversity Framework. In addition, it allows for increased ambition by promoting synergies between adaptation and mitigation targets, which can increase the cost-efficiency and positive impact of simultaneously delivering on the countries' climate actions.

Specifying these actions also highlights the priority sectors and needs for further international climate finance. This can be done by using existing frameworks like the EbA criteria developed by the Friends of Ecosystem Based Adaptation[25] used at the UNFCCC and CBD, which offers quantitative and qualitative information on climate and livelihood impacts and ecosystem health.

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24 Duarte, C. et al (2013). The role of coastal plant communities for climate change mitigation and adaptation. Nature Climate Change, 3 (961–968).

25 https://www.iucn.org/theme/ecosystem-management/our-work/ecosystem-based-approaches-climate-change-adaptation/friends-eba-feba

These indicators can be used to define or refine a country's adaptation targets for its coastal areas. Additionally, highlighting coastal wetlands within adaptation targets may be a suitable first entry point for countries focused on climate change impacts and have yet to quantify the mitigation value of their coastal wetlands, or where their mitigation potential is constrained. While further information and guidance are needed to fully align NDC mitigation and adaptation workstreams and gather quantifiable adaptation targets and impacts across these workstreams, experience and best practices for countries to learn from are becoming available (see Box 2).

BOX 2. Examples of how countries have included blue carbon ecosystems for adaptation plans and actions in NDCs.

BELIZE 2021 UPDATED NDC

NDC presented with/prepares for:

- National Climate Change Policy, Strategy and Action Plan (NCCPSAP)
- Belize's Growth and Sustainable Development Strategy (GSDS)
- Sectoral vulnerability and adaptation assessments—six priority development sectors; namely, coastal development, agriculture, water, tourism, fisheries and health (in 4th National Communication)
- Belize's Fourth National Communication
- Integrated Coastal Zone Management (ICZM) Plan—incorporates ecosystem services and integrated risk analysis into decision-making
- The Forests (Protection of Mangroves) Regulations of 2018—protects mangroves from degradation and deforestation through the establishment of a permitting system
- The National Biodiversity Strategy and Action Plan (2016)—aims to protect and restore Belize's natural ecosystems, including those along the coast

Specific measures/actions foreseen in the NDC

Coastal and marine resources:

- Improve the ability of the country's mangrove and seagrass ecosystems to serve as a carbon sink by 2030.
- By 2025, protect an additional 6,000 hectares of mangroves, and by 2030, provide protections to an additional 6,000 hectares. Belize already has 12,827 hectares under protection.
- Restore 2,000 hectares of mangroves by 2025 and an additional 2,000 hectares by 2030.
- By partnering with local communities, private landowners and other key stakeholders, halt and reverse mangrove loss by 2025.
- Update the country's seagrass maps. Additionally, begin the development and implementation of a national seagrass management policy, including the identification of priority areas for protection.
- By 2022, carry out a comprehensive mangrove carbon stock assessment.
- Explore financing opportunities to support the protection and restoration of mangroves.

Tourism:

- Identify coastal tourism areas that are vulnerable to climate change.
- Support climate resilience and climate adaptation through the promotion of local practices.

Fisheries:

- Create and implement fisheries and mangrove conservation and management plans.

Forestry:

- Complete REDD+ Strategy and design systems for monitoring, information and safeguards. Additionally, take stock of mangrove cover and tropical forests and promote community land stewardship practices.

CHILE 2020 NDC AND 2022 REVISION LETTER

NDC presented with/prepares for:

- Long-Term Climate Strategy 2050: presented in November 2021 with three main focus areas: 1) transition of the productive sectors; 2) human settlements and life in communities; and 3) the ecosystem functions and NbS.
- Update to the National Adaptation Plan (with 11 priority areas): The participatory process of this document started in December 2022 and is set for completion by December 2023.
- 2022 First Adaptation Communication
- First Adaptation Plan on Water Resources: The latest readiness proposal submission was presented in November 2022, with a completion date of December 2023.
- 2021–2028 Updates on Fisheries and Aquaculture
- 2027 Update on Coastal Areas

Specific measures/actions foreseen in the NDC

Ocean:

- Establishment of new marine protected areas in under-represented marine ecoregions and in coastal ecosystems for wetlands. The NDC includes progressive targets for the protection of under-represented marine ecoregions in the framework of a participatory marine spatial planning and the establishment of coastal wetlands as new protected areas.
- All marine protected areas created up to 2020 will have a management or administration plan in place, and under effective implementation, with specific focus on adaptation. The NDC includes progressive targets for the establishment of such management or administration plans and for their implementation through monitoring, control, community involvement and threat control programs.
- Co-benefits related to mitigation and adaptation of different ecosystems in marine protected areas will be assessed and actions will be implemented to enhance them, through progressive targets for creating and implementing standardized metrics to evaluate their capacity for adaptation or mitigation.

Wetlands:

- By 2025, peatland areas and any other types of wetlands will be identified under a national inventory.
- By 2030, standardized metrics will have been developed for the evaluation of wetlands, especially peatlands, implementing actions to enhance their co-benefits.

Ecosystems:

- The National Plan for the Restoration of Landscapes 2021–2030: presented in December 2021, with the main goal of restoring 1,000,000 hectares of vulnerable landscapes by 2030, prioritizing those facing greatest social, economic and environmental vulnerabilities. At the landscape level, the goals will be defined according to each territorial context and in agreement with the territorial actors.

SEYCHELLES 2021 UPDATED NDC

NDC presented with/prepares for:

- Marine Spatial Plan: Seychelles commits to the implementation of its adopted Marine Spatial Plan and the effective management of the 30% marine protected areas within the Seychelles' Exclusive Economic Zone (EEZ).
- Coastal Management Plan: Prioritizing NbS to protect coastal ecosystems from climate change impacts such as storm surges, flooding and erosion, using the Coastal Management Plan as a guideline for implementation of NbS.

- Seychelles commits to undertaking research to better understand, plan for and address vulnerabilities of the key economic sectors to climate change, e.g. fisheries, tourism, agriculture and the impacts of climate change on marine and terrestrial biodiversity and ecosystems.

Specific measures/actions foreseen in the NDC

Coastal ecosystems:

- Protect its blue carbon ecosystems, i.e., at least 50% of its seagrass and mangrove ecosystems by 2025 and 100% of seagrass and mangrove ecosystems by 2030.
- Map the full extent of the blue carbon seagrass and mangrove ecosystems within its waters and measure their carbon stock values.
- Establish a long-term monitoring program for seagrass and mangrove ecosystems by 2025 and include the GHG sink of Seychelles' blue carbon ecosystems within the national GHG inventory by 2025.

Tourism:

- Develop and implement a climate change strategy for the tourism sector, incorporating long-term sustainable planning and management of tourism infrastructure and coastal management, in partnership with the private sector.

Fisheries:

- Develop and implement effective, sustainable and license-based fisheries management plans, integrating climate change adaptation, to ensure sustainable use of resources and avoid overexploitation.

An NDC that positions the benefits of protecting, restoring and sustainably managing blue carbon ecosystems primarily through the lens of adaptation does not preclude the recognition of mitigation benefits. In fact, adaptation targets and actions are often the best entry point for countries to start prioritizing blue carbon ecosystems, and the mitigation co-benefits can be formally included in a country's Biennial Transparency Report. Acknowledging the mitigation co-benefit value of these actions solidifies the importance of blue carbon ecosystems and links them with the NDC reporting systems to ensure that the mitigation value is accounted for or recognized even through its adaptation action.

While it is not required to quantify the mitigation co-benefits of blue carbon ecosystem adaptation commitments to the full extent detailed in the mitigation guidance section below, default values provided within the 2013 Wetlands Supplement mean than an approximate quantification can still be made even in instances where locally specific field/carbon data is not available. The very acknowledgement of the mitigation co-benefit of coastal wetlands within an NDC can still serve an important function in increasing awareness of and greater action toward the full suites of benefits these ecosystems provide.[26]

26 For more information, see https://www.nature.org/content/dam/tnc/nature/en/documents/Guide_to_Including_Nature_in_NDCs.pdf. Beasley, E., Schindler-Murray, L., Funk, J., Lujan, B., Kasprzyk, K., Burns, D. (2019). Guide to Including Nature in Nationally Determined Contributions: A checklist of information and accounting approaches for natural climate solutions. Conservation International, The Nature Conservancy, Land Use and Climate Knowledge Initiative, Environmental Defense Fund, National Wildlife Federation, Climate Advisers, Wildlife Conservation Society, Nature4Climate.

THIRD PILLAR
Mitigation: Blue Carbon and Mitigation Targets

What are NDC mitigation commitments?

The Paris Agreement (Decision 1/CP.21) and the Katowice Climate Package of 2018 (Decision 1/CP.24 and Decision 3/CMA.1), outline the key elements of the mitigation section in an NDC. While they do not pre-define the scope, content or level of ambition of each NDC, there is a requirement to provide "the information necessary for clarity, transparency and understanding"[27] (referred to as "ICTU"). The requirement to provide ICTU ensures that NDCs are comparable while maintaining their nationally-determined nature. Following the adoption of the Katowice Climate Package, providing ICTU was strongly encouraged for first NDC updates. Now, countries are required to provide ICTU for their second and subsequent NDC updates, which should be released in 2025.[28] The ICTU will be reviewed and updated in 2027, if necessary (4/CMA.1). Box 3 outlines the ICTU requirements to include in an NDC[29] and provides advice for countries interested in integrating blue carbon.

BOX 3. Information to provide clarity, transparency and understanding (ICTU) of NDCs and their relevance for blue carbon.

NDC ICTU REQUIREMENTS & RELEVANCE TO BLUE CARBON

Quantifiable information on the reference point (including, as appropriate, a base year);

- In this section, countries must provide relevant information about seven potential categories of quantifiable information which may be needed to understand mitigation target reference points, including any numerical targets, any base year (past year to measure against), the target year (when it will be achieved), any GHG emissions baselines and projections (e.g., as needed for targets related to "business as usual" emissions scenarios) and other information needed to understand how the NDC target was developed and can be measured against.
- For economy-wide targets that include blue carbon ecosystems and/or any sectoral targets related to blue carbon ecosystems, information reported in this section should be consistent with the national GHG inventory, as relevant, and/or be clear about the reference points and information used to produce any area-based or percentage reduction targets.
  - For example, Uruguay in its 2015 NDC committed to, inter alia "avoid CO_2 emissions from [soil organic carbon] in 100% of the peatlands area of year 2016 (8.366 ha)"
- Area-specific reference points may be communicated in line with information on existing structures, for instance, existing REDD+ programs or on Marine Protected Areas (MPAs).

Time frames and/or periods for implementation.

- In this section, countries must provide information relevant to understand the NDC time frame. As of the Glasgow Climate Pact, countries are encouraged to adopt common time frames for NDC updates and target years: communicating in 2025 an NDC with an end date of 2035, in 2030 an NDC with an end date of 2040 and so forth every five years thereafter.[30] Countries whose existing NDCs have a 2030 end date are not required to revise their NDC in 2025; though all countries are urged to consider increasing their NDC ambition to align with the mitigation target of the Paris Agreement, in acknowledgement of the pre-2030 ambition gap.[31]

27 Article 4.8 Paris Agreement.

28 Decision 4/CMAP.1, paragraph 7.

29 Decision 4/CMA.1, Annex I.

30 CTF Decision 2, paragraph 2.

31 Cf. Decision 1/CP.21, paragraphs 23 and 24; Decision 1/CMA.2, paragraph 7.

- Countries may consider and communicate whether implementation timeframes for targets related to blue carbon ecosystems need to span multiple NDC implementation periods, given the long-term planning and MRV needs associated with carbon sequestration and storage in soils.

Scope and coverage

- In this section, countries must provide the details needed to understand the sectors, emissions categories, activities, sources and sinks, pools and gases included within their NDC target. The scope and coverage of any mitigation co-benefits arising from adaptation actions and/or economic diversification plans should also be described here.
- Details related to the scope and coverage of targets for land sector, AFOLU, LULUCF or coastal wetlands should be described here.
- For sectors a Party does include, the sources and sinks (categories, pools and gases) that are not considered in the national inventory report (even though IPCC estimation methods exist) must be highlighted and the Party must give reason for the exclusion.

Planning processes

- In this section, countries should provide qualitative information on four elements related to how the NDC was developed and will be implemented, including participatory consultation processes, coordination with regional groups, national context and ongoing projects.
- Countries could elaborate on how adaptation actions in coastal wetlands will result in mitigation co-benefits by detailing specific projects, measures and activities to be implemented. Key sectors could include: national resources, water resources, coastal resources, agriculture and forestry.
- In their 2025 NDC update, Parties should describe how the outcomes of the Global Stocktake (GST) have informed their next or updated NDC, particularly areas that the GST highlights around the benefits of NbS and/or blue carbon ecosystems.

Assumptions and methodological approaches including those for estimating and accounting for anthropogenic greenhouse gas emissions and, as appropriate, removals

- In this section, countries must provide technical information related to how their NDC targets were developed, including how GHG emissions are estimated and how non-GHG targets were set. In essence, this information should enable third-party reviewers to reconstruct NDC targets using any country-specific methodology.
- For GHG targets related to blue carbon ecosystems, countries should communicate whether they have used the 2013 IPCC Wetlands Supplement, as well as any approach used to account for emissions from natural disturbances on managed coastal lands. For any targets based on GHG emissions not estimated using IPCC guidelines, specific details must be provided to enable an outside reviewer to understand how the GHG emissions were estimated and the target was constructed. A similar level of detail should be provided for any area-based targets.
- Each Party must apply (or work towards applying) the latest available IPCC guidelines for GHG inventories.
- Each Party is also “encouraged” to use the 2013 IPCC Wetlands Supplement, which contains guidelines for countries on improving their inventorying and reporting of GHGs from wetlands. In practical terms, this means countries are mandated to use the supplement when possible and feasible.
- For select REDD+ countries, some national or subnational programs include mangrove forests and thus are included in the existing national MRV reporting systems. Note that the existing reporting may be limited to aboveground biomass, not the soil carbon stock, indicating that it would be useful to clarify specific line items in this section. Given that the majority of carbon stored in blue carbon ecosystems is in the soil, GHG inventories should consider including soil organic carbon (SOC) for comprehensiveness.
- Parties considering utilizing voluntary cooperation under Article 6, are requested to indicate their intention in this section.

How the Party considers its NDC to be fair and ambitious in the light of national circumstances

- The section prompts countries to explain the level of ambition in their NDC based on considerations of equity and justice, which may include notions of social and environmental justice, as well as inter-generational equity and transnational justice.
- Countries should consider how dedicating attention and resources to the health of coastal wetlands enhances the fairness and ambition of their NDC, as these ecosystems are often essential for supporting local communities vulnerable to a changing climate and increasing hazards.

How the NDC contributes towards achieving the Convention's objectives

- Countries should consider that the global climate cannot be stabilized by well below 2°C without significant emissions reductions and removals through NbS, including the conservation and restoration of coastal wetlands. A reference can be made to Article 4 of Convention, in particular to the language on ocean/coasts.

What type of targets can be used to reflect mitigation action from coastal wetland management?

The Paris Agreement's NDC guidelines allow for significant flexibility for countries to develop their NDC targets according to their national circumstances. However, all countries are ultimately expected to formulate economy-wide targets over time, which would include land use and therefore coastal wetlands. Developing countries retain discretion over whether and when to include more sectors as they move toward economy-wide NDC targets.

When considering how to include a mitigation target for blue carbon in an NDC, it is important to distinguish between economy-wide targets and sectoral or implementation targets (see below). Coastal wetlands can be integrated in all target types.

TYPES OF TARGETS

NDCs can contain a variety of targets.[32] These could include, but are not limited to, GHG targets, sectoral targets and/or non-GHG targets.

ECONOMY-WIDE TARGETS (GHG AND NON-GHG) set a target covering all major sectors and emissions in an economy, generally understood to cover all six IPCC sectors (Energy, Transport, Waste, Agriculture, LULUCF and IPUU). For example, "a reduction of at least 55% in greenhouse gas emissions by 2030 compared to 1990 emissions" (European Union, 2020) or "43 percent below 2005 levels by 2030" (Australia, 2022). However, some developing countries may decide to set their NDC target based on non-GHG measures in economic diversification plans or other policies and measures.

Coastal wetlands should be covered in a true economy-wide NDC target, but two elements may complicate this. First, if emissions from coastal wetlands are not included in the national GHG inventory (e.g., using the IPCC Wetlands Supplement), it can be more difficult to include them in the NDC as part of a harmonized economy-wide target. If this is the case, countries can still set an NDC target for coastal wetlands (GHG or non-GHG), but they will need to develop and communicate the reference indicators, accounting approach and methodology used to do so. This information may not be consistent with the economy-wide target and any differences should be noted. Secondly, even where countries generally report emissions from coastal wetlands, the figures may not be as robust as terrestrial factors used to account for coastal ecosystems. To improve clarity and understanding, countries are encouraged to detail the specific values used for coastal wetlands in the relevant sections of the NDC (such as the ICTU table).

32 Fransen, T., E. Northrop, K. Mogelgaard, and K. Levin. 2017. "Enhancing NDCs by 2020: Achieving the Goals of the Paris Agreement." Working Paper. Washington, DC. World Resources Institute. Available online at http://www.wri.org/publication/NDC-enhancement-by-2020

SECTORAL TARGETS (GHG AND NON-GHG) refer to those set for specific sectors and may be instead of or complementary to economy-wide targets. For example, the Democratic Republic of Congo (2021) set its NDC target for only four of the IPCC sectors, as "21% of emission reductions below BAU for the following sectors: Energy, Agriculture, LULUCF and Waste". While it is encouraged for NDC sectoral targets to be consistent with the national GHG inventory, for some countries, the coastal zone could be considered as a separate sector with specific targets. Countries with LULUCF sectoral targets should specify the extent to which coastal wetlands are included. Generally, sector-specific NDCs can provide more flexibility to match NDC targets to a country's available data sources and technical capacity related to coastal wetlands, enabling targets to be limited to select ecosystem types (e.g., mangroves).

In either scenario—economy-wide or sectoral—countries should clearly indicate the approach and methodology used for accounting, ideally moving towards implementation of the IPCC Wetlands Supplement. Where countries are still in the process of building the inventory to reflect wetlands' emissions, a stepwise approach is appropriate. The commitment to use the IPCC Wetlands Supplement can be indicated in the NDC and then linked to the start of the new Biennial Transparency Reports (BTRs) in 2024 or in the subsequent NDC revision process (2025, 2030, etc.).

Example text for how an NDC can make explicit reference to coastal wetlands is provided below (the text elements presented are examples only and do not represent an exhaustive list of design options):

Sample Language on Scope and Methodological Approaches (Economy-Wide Targets):

- *"The NDC has an economy-wide scope, which includes the mitigation potential of protecting [and] [or] restoring coastal wetlands."*

- *"[Party] used the latest IPCC guidance for the preparation of its inventory and NDC. This includes the application of the 2006 Guidelines for National Greenhouse Gas Inventories, as well as the 2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands, and the 2019 Refinement to the 2006 Guidelines for National Greenhouse Gas Inventories."*

Sample Language on Scope and Methodological Approaches (Sector-Wide Targets; Stepwise Approach):

- *"The NDC scope includes Agriculture, Forestry and Land-Use, including in coastal wetlands… [Party. used the 2006 Guidelines for National Greenhouse Gas Inventories to prepare its NDC, and may update its NDC when additional IPCC guidelines are adopted. [Party] will consolidate and refine the current data in its […] Biennial Update Report (BUR) and its first Biennial Transparency Report due in 2024 to ensure that [Party] reports and accounts for emissions and removals in accordance with the 2013 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands, and the 2019 Refinement to the 2006 Guidelines for National Greenhouse Gas Inventories…"*

IMPLEMENTATION TARGETS can be set to complement economy-wide or sectoral targets, or to set targets for emissions and/or ecosystems not already included in a sectoral target. These targets can be expressed in GHG equivalencies (eq.) or as non-GHG targets. For instance, Japan sets an economy-wide target to reduce its GHG emissions by 46% below 2013 levels by 2030, which is broken down into specific targets, including one to reach 47.7 million tCO2eq of GHG removals in 2030.[33] Japan elaborates these targets will be met through measures in the food, agriculture, forestry, and fisheries industries, as well as through nature-based solutions, among others. Uruguay sets an implementation target to "conserve 50% of the peatland area by 2020 (4.756 ha)".[34] Sometimes GHG metrics and non-GHG metrics are mixed. For instance, Chile (2020) has committed to the "sustainable management and recovery of 200,000 hectares of native forests, representing GHG captures of around 0.9 to 1.2 $MtCO_{2eq}$ annually by 2030".[35] The nature and completeness of these statements reflects the level of information available to a country.

33 Japan, First Nationally Determined Contribution, Interim Updated Submission (2022), 1

34 Uruguay, Second Nationally Determined Contribution (2022), 15.

35 Chile, First Nationally Determined Contribution - Updated Submission (2020), 54.

Building implementation targets into NDCs allows countries to illustrate with more precision how they want to reach the overall commitments. In this sense, they can be part of the "planning" element in the NDC architecture. On the other hand, these targets also present the opportunity to include emissions or ecosystems for which there is insufficient data to set GHG targets or sector-wide targets. For coastal wetlands, specific implementation targets present the opportunity for countries to design concrete blue carbon actions and processes while including both mitigation and adaptation goals. Specific blue carbon targets allow a country to connect the climate change commitments with existing programs and initiatives that may be outside the climate change framework. There are myriad ways to formulate implementation targets. Useful common features include but are not limited to:

- Specific policies and actions tailored to specific blue carbon ecosystems (e.g., coastal management and coastal zone planning policies)
- Substantial conservation objectives (e.g., a target for slowing or even halting degradation of mangroves within five years)
- Clear and achievable restoration targets (e.g., reforestation of x hectares of mangroves).

Example of options for draft language that could be included:

"[Party] will conserve existing coastal wetlands through the establishment of x hectares of marine protected areas. [Party] will also over the next five (5) years restore x hectares of previously removed or degraded mangrove forests. The measure is expected to generate x tCO_{2eq}. in [reduced] and/or [newly sequestered] emissions."

CONSIDERATIONS FOR TARGETS INVOLVING PROJECTION SCENARIOS

Many countries choose to set NDC targets based on reductions below the projection of a future scenario, often called a baseline, reference or "business-as-usual" (BAU) scenario. These types of targets are popular because they allow for continued—but slower—growth, rather than absolute reduction targets based on lowering growth below a specific reference year. While projections are often used to formulate mitigation targets, they may also be relevant for adaptation targets, as they can be set for any indicator that has an upward trajectory, e.g., rate of GHG emissions, rate of mangrove clearance, or number of people vulnerable to climate change.

Under the new Biennial Transparency Reports, all countries will be required to report GHG projections, though developing countries will have flexibility to adjust for their national circumstances. However, unlike GHG emissions, which have very clear methodologies and universal guidelines developed by the IPCC, there are currently no global best practice guidelines that countries are required or encouraged to use when developing projection scenarios for NDCs. Furthermore, while developed countries are already requested to communicate information about projection scenarios via their National Communications and Biennial Reports, developing countries have never been requested to do so, and thus, they often have large information and capacity gaps in this regard.

Since the ambition of NDC targets based on projection scenarios can be affected by the robustness and accuracy of the scenario, countries wishing to set NDC targets in this manner should begin building their respective capacities to develop better projections, as well as to begin transparently reporting the approach, methodology and other relevant information. This information should be included within the ICTU section of an NDC or other relevant national communications, in addition to the BTR. Countries should also consider updating NDC targets along with any revised projection scenarios or availability of significant, updated data sources relevant to a projection scenario.

Some resources and tools already exist for countries to understand and begin developing robust projection scenarios. For example, the Partnership on Transparency in the Paris Agreement has published the Projections of Greenhouse Gas Emissions and Removals: An Introductory Guide for Practitioners. Countries can also communicate needs related to building projection scenarios and apply for funding through the UNFCCC Capacity-Building mechanisms and initiatives, such as the Capacity-Building Initiative for Transparency (CBIT).

BOX 4. Special Considerations to Include Blue Carbon for REDD+ Countries.

SPECIAL CONSIDERATIONS FOR REDD+ COUNTRIES

REDD+ refers to Reducing Emissions from Deforestation and forest Degradation and the role of conservation and sustainable management of forests and enhancement of forest carbon stocks in Developing Countries. Many non-Annex I countries' first experiences with developing GHG inventories for the LULUCF sector were through developing REDD+ programs. An opportunity exists for lesson and capacity sharing in the development of blue carbon approaches, as the technical experts that developed forest inventories may be able to provide advice or guidance on capacity and technical needs to implement the IPCC Wetlands Supplement. A key blue carbon category—mangroves—is also covered by many national REDD+ programs, although the carbon dense mangrove soils are often excluded.

REDD+ countries with coastal ecosystems are therefore well placed to extend their NDCs to cover blue carbon ecosystems. When considering how to account for blue carbon ecosystems in their NDCs, the following steps may be taken:

- Determine whether mangrove forests already being accounted for in the NDC are part of REDD+:
  - Are mangroves part of my National Forest Definition?
  - Does the Forest Reference Level (FRL) include all mangrove carbon pools including soil carbon? If so, are there separate measures related to soil carbon stocks that can be included in the NDC?
  - Are the mangrove ecosystems that don't fall under the official forest category accounted for in a different section of the GHG inventory?
  - Are there MRV/FREL or other GHG accounting methodologies and plans that are used in my REDD+ programs that can be applied to my blue carbon ecosystems?
- Determine which governmental Ministries or Departments are responsible for forests and coastal ecosystems collaborating to report on GHG emissions/reservoirs in order to streamline action for their inclusion in the NDC.
- Determine how data sources can be improved to more accurately and completely account for all carbon pools, specifically including soil organic carbon.

CASE STUDY: INCLUSION OF BLUE CARBON IN BELIZE'S NATIONAL MRV REPORTING SYSTEMS

As highlighted in Pillar 2, in its adaptation-focused 2021 NDC, Belize committed to conducting a comprehensive mangrove carbon stock assessment. The country began its carbon assessment in September 2021. Led by the Smithsonian Institution in partnership with the University of Belize, World Wildlife Fund, and supported by The Pew Charitable Trusts, the project brought together government departments, local NGOs and international researchers who took more than 1,300 sediment samples and completed nearly 4,000 tree measurements to estimate the amount of carbon stored in Belize's mangroves. Knowledge sharing workshops that helped to teach standardized blue carbon sampling methods and created pathways to future data sharing were critical parts of this effort.

The findings of this first-time comprehensive study were recently published and are an important part of the country's implementation efforts. In March 2023, Belizean government agencies, in partnership with The Pew Charitable Trusts and World Wildlife Fund, led a workshop to begin the process of integrating the mangrove carbon assessment data into its REDD+ inventory. As mangroves are considered forests instead of wetlands in Belize, mangrove carbon is accounted for under REDD+.

FOURTH PILLAR

Greenhouse Gas (GHG) Reporting and Inventories for Blue Carbon Ecosystems

Countries that choose to include a GHG mitigation target for coastal wetlands in their NDCs (whether by way of an economy-wide or a sectoral target) should ensure that their inventories accurately report emissions and removals from coastal wetlands, or otherwise note any inconsistencies.

TABLE 3. Key IPCC Guidance

Key IPCC Guidance	
2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands	The 2006 Guidelines provide a technically sound methodological basis for measuring national greenhouse gas inventories. The coverage of the 2006 IPCC Guidelines on wetlands is restricted to peatlands drained and managed for peat extraction, conversion to flooded lands and limited guidance for drained organic soils.
2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands	The 2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands (Wetlands Supplement) extends the content of the 2006 IPCC Guidelines by filling gaps in coverage and providing updated information reflecting scientific advances, including updating emission factors. It covers inland organic soils and wetlands on mineral soils, coastal wetlands including mangrove forests, tidal marshes and seagrass meadows and constructed wetlands for wastewater treatment.
2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories	The 2019 Refinement provides supplementary methodologies to estimate sources that produce emissions of greenhouse gases and sinks that absorb these gases. It also addresses gaps in the science that were identified, new technologies and production processes have emerged, or for sources and sinks that were not included in the 2006 IPCC Guidelines.

What carbon data is required to reflect mitigation action from coastal wetland management in relevant mitigation target(s)?

1. **How do national GHG inventories support the NDC process?**

   Inventories of GHG emissions and sinks provide comprehensive tracking of GHG emissions and carbon stocks from human-caused sources. They are an important tool for monitoring the efficacy of evidence-based climate mitigation policies (including NDCs), regulations and voluntary actions, and are also useful for prioritizing future action across sectors. All Parties are also required to report greenhouse gas emissions under the Paris Agreement. At the same time, information gathered to build GHG inventories, particularly changes in land use, can also support tracking of climate adaptation policies, regulations and actions, as well.

2. What is necessary for an inventory?

To prepare robust national GHG inventories that are comprehensive using the latest available data for blue carbon ecosystems, Parties need to first understand the extent of those ecosystems by mapping their distribution. The government or research institute can then calculate the above and below ground carbon stocks using the IPCC Wetlands Supplement. This is generally done through the National Forest Inventory process. A Party will then develop a consistent time series (i.e., the same data sources, image processing and calculation methods are used across the analysis time frame) to estimate carbon gains and losses from relevant land use and land use change (LULUCF). This is a process that should be harmonized with the country's REDD+ Strategy so all accounting is unified.

BOX 5. Quantifying activity data and emissions factors for blue carbon

- **Activity data – Mapping the extent and change of land use/land cover over time:**
  - Governments need to know the location and extent of blue carbon ecosystems in their country. They also need to know how that has changed over time for the purposes of inventory reporting (these historical dynamics are also known as "activity data"). This is generally accomplished by using remote sensing imagery and a geographic information system to compare, based on harmonized methods, the historical changes in land use/land cover for any number of target ecosystems, including mangroves. For example, comparing how many mangroves existed in a baseline in 2005 compared to 2030 constitutes the mangrove "activity data" for that period.

- **Estimating carbon stocks:**
  - With an established understanding of habitat coverage and change, governments need to know how much carbon these ecosystems store, sequester and/or release if lost or degraded. The first step in this process is to measure carbon stocks for standard IPCC land cover and land use categories. IPCC Good Practice Guidelines and supplementary guidelines provide field and laboratory methods for estimating carbon stocks in five standard carbon pools that comprise every type of land use/land cover category or ecosystem type.

- **Emissions factors – Estimating rate of carbon accumulation and loss over time:**
  - Governments need to know how the carbon stock changes with land use/land cover dynamics of and from human impacts on degradation or recovery of blue carbon ecosystems. For example, if the land use is changed from a pristine mangrove to a settlement, the original carbon stock will decrease (emissions are realized). In contrast, if land is restored from agriculture to a wetland, the carbon stock will increase (from removal of CO_2 from the atmosphere and sequestration in soils and biomass). The magnitude of emissions (or removals) will depend upon the type of land use/land cover transition that takes place. The depth of carbon in the soils below the ecosystem is critical for estimating blue carbon stocks and potential emissions. Accounting for a soil depth of 1 meter is becoming a minimum standard for blue carbon ecosystems, although soil carbon sampling for GHG inventories might be done to shallower depths for other land use/land cover categories.

The past decade has produced accessible global datasets and methodologies, including the IPCC Wetlands Supplement, to track this information and to permit countries—whatever the level of capacity—to substantially improve on their status-quo inventories and transparency approaches.

3. How can countries develop blue carbon data to be reported in inventories?

Blue carbon ecosystems are a covered land-use category under UNFCCC GHG reporting guidance in the AFOLU category. Within the UNFCCC GHG guidance these ecosystems are generally referred to as "coastal wetlands" rather than using the "blue carbon" terminology.

The 2006 IPCC Guidelines classifies all lands into six broad land-use categories: Forest Land, Cropland, Grassland, Wetlands, Settlement and Other Lands. The IPCC Wetlands Supplement,

Chapter 4 on Coastal Wetlands, provides more detailed guidance on how to treat human-caused emissions and removals associated with specific human activities that affect wetlands. The guidance applies to terrestrial and coastal wetlands. Coastal wetlands in the IPCC Wetlands Supplement include three 'actionable' blue carbon ecosystems: mangrove forests, tidal marshes and seagrass meadows. Emissions factors and methodologies are provided for management actions including mangrove forest management practices, rewetting, revegetation and creation, aquaculture and drainage.

BOX 6. Inventory Reporting Under UNFCCC

Paris Rules for GHG Inventories: Incoming Reporting Formats

The adoption of the Paris Agreement (COP21 in Paris) and of the Katowice Climate Package (COP24 in Katowice, Poland) created the Enhanced Transparency Framework (ETF)[36] which builds on the transparency arrangements of the UNFCCC, including National Communications and Biennial Reports, and defines fresh rules and procedures to "provide a clear understanding of climate change action… including clarity and tracking of progress towards achieving Parties' individual [NDCs]" (Article 13.5 Paris Agreement). The ETF is centered on biennial reporting and technical expert reviews, common to all Parties, with flexibilities for Least Developed Countries (LDCs) and Small Island Developing States (SIDS). By 31 December 2024 at the latest, all Parties must move to reporting formats known as Biennial Transparency Reports (BTRs). Under the new reporting requirements, the use of the 2006 IPCC Guidelines for National Greenhouse Gas Inventories is required for all Parties—with several areas of flexibility for LDCs and SIDS, in particular, and the use of the IPCC Wetlands Supplement is encouraged for all Parties.

While the transparency rules are common to all (with exceptions for LDCs and SIDS), developing countries can self-determine their ability to meet all reporting requirements and make adjustments.[37] Moreover, how Parties carry out the review and reporting or which accounting methodologies and indicators they use may,to a large extent, also be self-determined. Countries may use "nationally appropriate methodologies" to prepare their inventory reports, as long as these are consistent with the 2006 IPCC Guidelines and could also use self-identified indicators (quantitative or qualitative) to report on NDC progress.

GHG Accounting: Current Reporting

Thus far, developed countries submitted inventory reports annually to meet the requirements of the UNFCCC and in reporting against targets such as the Kyoto Protocol or Cancun Agreements. Developed countries also submit National Communications every four years and Biennial Reports every two years. These reports cover emissions and removals of direct GHGs from five sectors: energy; industrial processes and product use; agriculture; land use, land-use change and forestry (LULUCF); and waste. Developed countries were "encouraged" to use the IPCC Wetlands Supplement (for inventories submitted from 2015 and beyond) and hence to include blue carbon ecosystems in their GHG inventories and associated reporting.[38]

As long as countries have not moved to the new reporting formats (see above), the previous rules on reporting continue to apply: National Communications should be submitted by developing countries every four years. Biennial Update Reports "should" be submitted by developing countries every two years from 2014 (consistent with the Party's capabilities or level of support). GHG inventories are part of the NCs and BURs provide an update on this information.

The IPCC 2019 Refinement to the 2006 Guidance further refines the information in the IPCC Wetlands Supplement by providing new guidance for CO_2 and non-CO_2 emissions from *Land Converted to Flooded Lands and Flooded Lands Remaining Flooded Lands*, specifically to assess changes in the soil carbon pool. Such emissions may be important, for example, recognizing the emissions associated with aquaculture in wetland areas.

36 The ETF was created by the Paris Agreement and the rules/details were defined by the Katowice Climate Package—although not all of them are set in stone, some select items are still to be negotiated as they weren't agreed at COP25.

37 Decision 18/CMA.1: Modalities, procedures and guidelines for the transparency framework for action and support referred to in Article 13 of the Paris Agreement, Annex, sec. 4–6.

38 Practical Implications of the Katowice Climate Package for Developing Country Parties and Land Sector Reporting, February 2020—Change Matrix table at the end of the document.

Importantly, the IPCC Wetlands Supplement and the 2019 Refinement follow the IPCC's standard "tiered" guidance to GHG accounting for the different levels of capacity and respective starting points for each Party. The subsequent sections will provide guidance on how to utilize the IPCC Wetlands Supplement. Tier 1 includes default GHG emissions factors (emissions and removals) for a range of activities (Table 4). These default values allow a country to start accounting for the carbon stocks in that ecosystem on the basis of estimated ecosystem distribution data. Parties with greater capacity and technical assistance can build more sophisticated assessments through subsequent Tier 2 and Tier 3 assessments, which require country-specific data plus repeated measures and modeling approaches.

Actionable blue carbon ecosystems for mitigation

IPCC GHG accounting guidelines currently only consider tidal marshes, mangroves and seagrasses to be actionable blue carbon ecosystems for mitigation. An ecosystem is considered "actionable" and can be integrated into climate mitigation policy if it possesses certain factors including significant carbon stocks, long-term carbon storage, and effective management and measurement techniques for GHG emissions and removals resulting from changes to these ecosystems.[39]

Emerging blue carbon ecosystems, which cover much larger areas and in some cases remove and store GHG at a significant scale, include macroalgae (kelp and seaweed), benthic sediments and mud flats.[40] Among those, most is known about macroalgae, which has been shown to be effective in sequestering carbon from the ocean via photosynthesis. Significant scientific uncertainties as to the quantity, location, permanence, and factors driving variability of carbon storage in these emerging ecosystems currently prevent their inclusion in GHG accounting.[41]

TABLE 4. Greenhouse gas emission and removals considered in the IPCC Wetlands Supplement, including activities covered and the ecosystems that are included.[42]

Activity	Sub-activity	Vegetation Types Affected
Activities related to CO_2 emissions and removals		
Forest management practices	Planting, thinning, harvest, wood removal, fuelwood removal, charcoal production	Mangrove
Extraction	Excavation to enable port, harbor & marine construction and filling or dredging to facilitate raising the elevation of the land	Mangrove, tidal marsh, seagrass
	Aquaculture — construction	Mangrove, tidal marsh
	Salt production — construction	Mangrove, tidal marsh
Drainage	Agriculture, forestry, mosquito control	Mangrove, tidal marsh

39 Blue Carbon Initiative (2021). Blue carbon: Integrating Ocean Ecosystems in Global Climate Action. Policy Brief. p.1. blue-carbon-integrating-ocean-ecosystems-october-2021a.pdf (conservation.org)

40 Rankovic, A., Jacquemont, J., Claudet, J., Lecerf, M. & Picourt, L. (2021). Protecting the ocean, mitigating climate change? State of the evidence and policy recommendations. Ocean & Climate Platform. Policy Brief. p.1-6. Policy-Brief_MPA.pdf (ocean-climate.org)

41 Blue Carbon Initiative (2021). Blue carbon: Integrating Ocean Ecosystems in Global Climate Action. Policy Brief. p.3. blue-carbon-integrating-ocean-ecosystems-october-2021a.pdf (conservation.org)

42 Table 4.1 Specific Management Activities in Coastal Wetlands – https://www.ipcc-nggip.iges.or.jp/public/wetlands/

Rewetting, revegetation & creation	Conversion from drained to saturated soils by restoring hydrology & re-establishment of vegetation	Mangrove, tidal marsh
	Re-establishment of vegetation on undrained soils	Seagrass
Activities related to non-CO_2 emissions and removals		
Aquaculture (use)	N_2O emissions from aquaculture use	Mangrove, tidal marsh, seagrass
Rewetted soils	CH_4 emissions from change to natural vegetation following modifications to restore hydrology	Mangrove, tidal marsh

4. What types of information are needed and when should it be applied?

To generate estimates of emissions and removals from wetlands, inventory compilers will need to gather "emissions factors" and "activity data" and, where possible, "secondary data" (such as soil type, climate zone, wetland type, size, water table level, vegetation composition and management practices). Guidance on data collection is provided in Chapter 2, Volume 1 of the 2006 IPCC Guidance.

It is good practice to focus on key categories, determining early in the process whether to estimate if human actions on blue carbon ecosystems influence a country's total emissions of GHGs. This could include determining overall GHG emissions (absolute level), trends over time, or the uncertainty in emissions and removals.

Activity data may be collected from in-country natural resource agencies or from national experts and supplemented if necessary, by internationally available data and default emissions factors for activities provided in the IPCC Wetlands Supplement. In the absence of unequivocal observational data, a country may also apply expert *judgment* to inform analysis of key categories and development of activity data (see 2006 IPCC Guidelines, ch2, vol 1 and Annex 2A.1 Sections 2.2 and 2.2.3). Emissions factors can be derived from the historical sequence of national forest inventories, combined with changes in land use/land cover. The Coastal Carbon Research Coordination Network[43] is a growing repository of global carbon data, with an emphasis on soil carbon stocks.

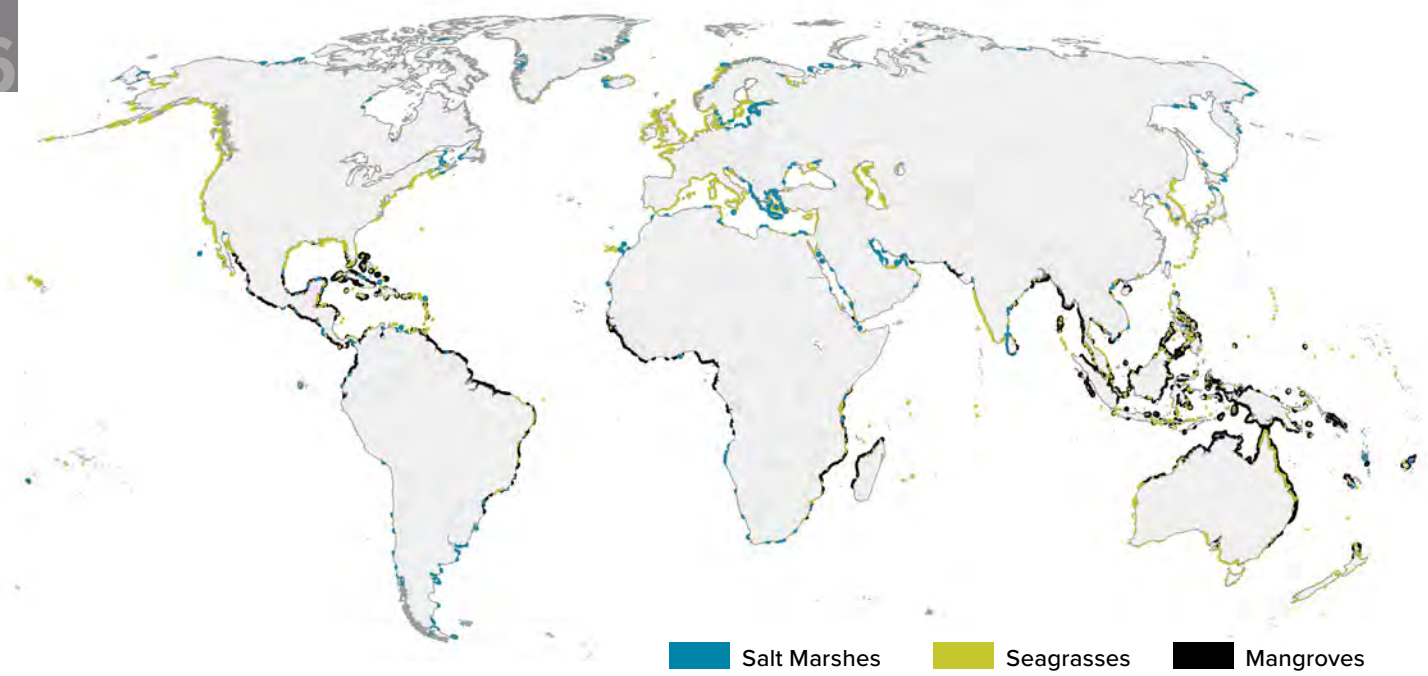
5. What data can be used to determine entry-point?

a. Mapping the extent

Data about the extent of coastal blue carbon ecosystems is the most comprehensive of these dimensions. At a national scale, satellite imagery is one of the most efficient approaches to mapping the extent of mangroves, with some countries already mapping mangroves as part of their forest inventory. Mapping technology is becoming increasingly sophisticated, including providing detail on species composition and associated carbon stocks. However, for inventory reporting purposes, historic maps/data are also required. Landsat and similar satellites that have been available for longer periods of time offer free imagery that can provide baseline extent information. Newer technologies can be incorporated as they become available and cost effective. Where national data are not available, global products (see Figure 3 as an example of one of such global maps) may be used as first approximations and a plan for improving these data should be drawn up.

43 Holmquist, J., Wolfe, J., Megonigal, P. (2021). CCRCN Blue Carbon Inventory. The Coastal Carbon Network at the Smithsonian Environmental Research Center. https://serc.si.edu/coastalcarbon

FIGURE 3. UNEP-WCMC compiled map of global blue carbon ecosystem distribution. Source: UNEP-WCMC



General distribution maps on seagrass and saltmarsh are now available.[44,45] However, technological and methodological challenges mean that assessments at a global scale of changes in cover remain in development.

b. Carbon stocks and emission factors

Global default emission factors for specific activities within mangroves, tidal marshes and seagrasses are available in the IPCC Wetlands Supplement as Tier 1 estimates. Country-specific emission factors will provide more accurate assessments and are part of the Tier 2 and 3 methodologies.

National assessments of the extent and carbon storage require a country to undertake a carbon sampling research program, designed in accordance with the country's needs and objectives. A country might decide to sample in several ecosystems to account for variation in type and location of ecosystems, as well as the different "states" and land uses. For example, sampling a deforested site, a site being reforested and a natural site will guide reporting on how ecosystems, and their carbon, change over time. Assessments of direct greenhouse gas emissions from a site in different states will provide even more accurate information for inventories. However, the technologies to undertake these assessments are not yet mainstream.

A number of countries including Australia, the United States and Indonesia already have national research programs assessing coastal wetland carbon stocks in progress which inform policy and inventory development. While complete data sets are not necessarily available in all countries, often at least partial information exists or can be provided from existing information systems (see Table 4 and Box 6).

c. Activity data and change over time

"Activity data" refers to data on the magnitude of a human activity—on energy use, industrial production and land management—resulting in emissions or removals taking place during a given period of time.[46] Activity data is inherently country specific and data gathering and research will need to be driven by the government. For example, it is important that a change picked up in remote sensing is attributed to the right activity so that the right emission factor and method can be applied.

44 Seagrass map: https://data.unep-wcmc.org/datasets/7

45 Saltmarsh map: https://data.unep-wcmc.org/datasets/43

46 IPCC Glossary, here

6. How can I utilize a step-wise approach?

Regardless of the pathway a country chooses, there is sufficient data globally at a Tier 1 level for any Party to begin reporting on relevant blue carbon ecosystems in their national GHG inventory. Several lessons have been learned from inventory reporting to date, and particularly reporting on coastal ecosystems. For example, there is significant value in gathering data and developing inventory accounting approaches that are refined over time. See Appendix 2 for more detail on global data sets.

a. Suggested Processes for Including Blue Carbon Ecosystems in a GHG Inventory

TABLE 5. Suggested steps and considerations for including Blue Carbon in GHG Inventory

Suggested Steps	Considerations
Undertake review of available data sets and technology (extent, emission factors, activity data)	• Are Tier 1 data sets and technology available and appropriate for your country? • Are there national data sets and technology available in lieu of Tier 1?
Organize a technical working group to guide the process	• Clarifying institutional roles, integrating national scale work flows (e.g., national forest inventories, REDD+ FREL/FRL and MRV) and developing government technical capacities to undertake the national GHG inventory is key to ensure the process is internalized and duly funded by the country in the long run. • Involving scientists can support the government to identify data and better understand activities that impact these ecosystems. Any research should be prioritized and undertaken to meet the needs of inventory reporting.
Develop a methodology for your circumstances	• Which activities/ecosystems are a priority? (consider available data, drivers of degradation) • Determine whether the country has the capacity to implement the IPCC Wetlands Supplement Chapter 4. If not, develop a step-wise approach and timeline to develop this capacity as part of the country's commitment to continued improvement. • Develop standard data collection guidelines, shared data repositories, QA/QC procedures and algorithms for data processing and calculations of emissions and removals.
Continue to refine and test the approach	• Absence of country-specific data does not preclude the application of IPCC default values, but will increase the level of uncertainty. • As data become available, improve methods for calculating emissions and removals factors to a Tier 2 level. a. Country-specific data to improve these factors include: 1) depth of soil impacted by drainage and excavation; 2) biomass, carbon stocks, 3) soil carbon stocks (depth of soils and soil carbon density), 4) direct measurement of CO_2 and non-CO_2 emissions from converted and/or rewetted wetlands, 5) carbon stock change in reforested mangroves and 6) direct measurement of non-CO_2 emissions from aquaculture. b. Seek out relevant existing analysis and datasets for developing Tier 2 emission factors, if needed. c. Fund and conduct new research to develop Tier 2 emission factors, if needed. • Engage process to develop Tier 3 models, if appropriate.

b. Pathways to Improve reporting of mangroves in forest inventory (e.g., REDD+) and incorporate coastal ecosystems in AFOLU reporting

BOX 7. Pathways to improve reporting of mangroves in forest inventory (e.g., for REDD+) and incorporate coastal ecosystems in AFOLU reporting

Improve reporting of mangroves in forest inventory (e.g., REDD+)

Many tropical countries include mangroves in their national forest definition and have already made progress in measurement, reporting and verification. Often this has been driven by participation in REDD+. Under REDD+, countries develop Forest Reference Levels and/or Forest Reference Emissions Levels (FRL/FREL, respectively) which calculate GHG fluxes from forest land over time and make business-as-usual assumptions for the future. Not all FRL/FREL calculations include comprehensive GHG data for mangroves which may result in an underestimation of comprehensive losses and gains. Given the special characteristics of mangrove carbon dynamics, it is important that countries take into consideration soil carbon (stocks and net accrual rates) when calculating the FRL/FREL, as appropriate. Examples of how to utilize the experience of REDD+ to improve reporting of mangroves in national GHG inventories include (i) to recognize the relevant deeper soil carbon pools and appropriate methodologies needed and (ii) to identify the activities within or leading to degradation or conversion of mangroves, respectively, and refer to IPCC Wetlands Supplement for estimating associated emissions (Table 4 on p. 34). On this basis, Parties can apply default (Tier 1) or country-specific soil datasets (Tier 2 or Tier 3) to complement the existing data.

Incorporate coastal ecosystems in AFOLU reporting

Tidal salt marshes, seagrasses and mangrove ecosystems that are not considered "forests" would fall under the *Wetlands* category of AFOLU reporting. Mangrove forests would be reported under Forest Land where they are part of the National Forest Definition. The importance of including soil carbon stocks and fluxes cannot be understated when dealing with any of the blue carbon ecosystems.

For activities that result in conversion of wetlands to drained lands, emissions will be reported under the land category to which the wetlands are converted. The procedures for calculating emissions are outlined in Chapter 4 of the IPCC Wetlands Supplement. Restoration of coastal wetlands may be reported under Lands converted to Forest Lands for mangroves forests or Lands Converted to Wetlands for tidal marshes, seagrasses and mangroves ecosystems that do not fall under the forest definition.

7. How are capacity constraints for reporting on coastal wetlands being addressed?

Only a handful of countries have begun reporting on coastal ecosystems within their GHG inventories. While developed countries have been reporting national data for many years under the UNFCCC and the Kyoto Protocol, reporting among developing countries is varied. Many developing countries only completed their first Biennial Update Report (BUR) in 2015. Submission numbers from the UNFCCC show the following data: 88 developing countries have completed their first BUR while only 37 have submitted a second, 25 a third, 12 a fourth and 2 a fifth BURs.[47] This suggests there is increasing capacity to develop and submit BURs. A key mechanism to support the development of inventories is the Capacity-building Initiative for Transparency (CBIT), in operation since December 2018 and supported by the Global Environment Facility.

As an indication of demand for inventory development driven by the reporting requirements under the Paris Agreement, the CBIT is now a US$130.8 million initiative that includes 75 national projects, one regional project that covers four countries and five global projects across Africa, Asia, Eastern

47 https://unfccc.int/BURs

and Central Europe (ECA) and Latin America and the Caribbean (LAC).[48] Many developing countries have also gained significant MRV experience reporting on forests and the land sector under REDD+. In this context, the Forest Carbon Partnership Facility's (FCPF's) Readiness Fund has helped dozens of countries improve their inventories and national forest management systems. Using FCPF support, Cambodia, for instance, developed emission factors for flooded forests and different types of mangrove forests; Madagascar is currently conducting its second national forest inventory, which has been completed for the mangrove and spiny forest ecoregions; and El Salvador commissioned a range of studies to identify priority areas (e.g., protected areas, wetlands and biosphere reserves).[49]

TABLE 6. Case studies for integrating blue carbon ecosystems into national accounting and reporting.

United States of America – Developing the inventory

- *All wetlands are recognized as managed lands*, mostly consisting of agricultural to tidal marsh transitions with restoration. Both Vegetated Coastal Wetlands and Unvegetated Open Water Coastal Wetlands were included, although sufficient data on seagrasses were not available as of 2018 (Crooks and Beers 2018).
- Accounting for transitions in land-use due to restoration activities (e.g., rewetting) is included. The reporting table shows areas of cropland, grasslands and other land categories converted to coastal wetlands.
- An interagency working group was created to facilitate effective collaboration between government offices, academics and a consultant team responsible for the accounts.
- Coastal wetlands sequester 8.5 $MMTCO_2$ each year, but erosion releases 1–7 $MMTCO_2$ per year (Crooks and Beers 2018).

The Republic of Indonesia – Accounting under REDD+

- Indonesia has 22.6 percent of global mangrove cover (Giri et al. 2011) and has some of the most carbon rich mangroves in the world (Donato et al. 2011, Atwood et al. 2017). Indonesia also has substantial seagrass resources. The mangroves of Indonesia are highly threatened by human activities including aquaculture, palm oil and infrastructure development, which could account for a substantial part of Indonesia's LULUCF emissions (Murdiyarso et al. 2015).
- Indonesia includes mangrove soil carbon in its GHG inventory process.
- Indonesia includes mangrove forests within their jurisdictional-scale REDD+ program under the Forest Carbon Partnership Facility's (FCPF) Carbon Fund.
  - There is a need to have consistency between REDD+ reporting and national inventory reporting.
- There are challenges as emission factors may vary spatially, among provinces and among species.
- Indonesia plans to include blue carbon in its revised NDC. However, the lack of data and methodology in quantifying carbon on seagrass remain the biggest challenge.
- The Government of Indonesia committed to several initiatives on blue carbon, including the National Blue Carbon Action Partnership with the World Economic Forum (WEF) and the Indonesia Blue Carbon Strategy Framework, which requires further alignment with Indonesia's NDC Target.

48 https://www.thegef.org/topics/capacity-building-initiative-transparency-cbit

49 FOREST CARBON PARTNERSHIP FACILITY (2019), Forest Carbon Partnership Facility 2019 Annual Report. https://www.forestcarbonpartnership.org/system/files/documents/FCPF_Annual%20Report_2019.pdf

Australia – Updating and extending the range of activities under Forest and Coastal Wetlands accounts

- Since 2017, Australia has reported coastal wetlands within its GHG inventory and reported mangroves within its forest category.
- Australia accounts for a range of anthropogenic activities that directly impact mangrove, seagrass, tidal marsh ecosystems. Activities include capital dredging that impacts subtidal seagrass, other extractive activities that remove these blue carbon ecosystems, and remediation, restoration and establishment activities that improve and/or extend these ecosystems.
- Australia continues to investigate better ways to identify and monitor anthropogenic activities that impact coastal wetlands, and improve the ability to monitor changes in their spatial extent and condition.
- Australia employs academic and public service technical experts to provide data and advice that improve its Land Accounts, including the Forest and Coastal Wetlands Accounts.
- Australia continues to incorporate new data, improve its spatial analysis, and apply new modeling approaches in the Land Sector in line with IPCC guidance on implementing a program of continuous improvement of the national greenhouse accounts, including the Forest and Coastal Wetlands accounts.
- Australia is promoting blue carbon activities that lead to both positive biodiversity and climate outcomes.
- Australia is working with developing countries to build technical capacity and enhance policy literacy through bilateral programs and supports knowledge sharing through the International Partnership for Blue Carbon.

Costa Rica – Developing the Inventory

- Preliminarily calculated emissions from mangrove loss, through conversion to shrimp farms and other land uses, and other blue carbon ecosystem loss between 1992-2014.
- Conducted a preliminary country-wide baseline mangrove blue carbon stock assessment in 2022, which serves as the basis for the country's blue carbon reference emissions level for mangroves.
- In February 2023, Costa Rica announced the launch of the country's National Blue Carbon Strategy, which provides a mechanism to implement Costa Rica's December 2020 NDC commitments, and to link blue carbon ecosystem restoration plans and monitoring actions with the national GHG inventory and a new community-based system of payment for coastal-marine ecosystem services.
- Coordination amongst national institutional and policy frameworks is ongoing to integrate blue carbon into the national GHG inventory and to implement the National Blue Carbon Strategy.
- Through EPA and the US Department of State's Transparency Accelerator for Greenhouse Gas Inventories, Costa Rica is acquiring necessary new technical capacities to implement the 2006 IPCC Guidelines and the 2013 IPCC Wetlands Supplement as part of their national GHG inventory systems.

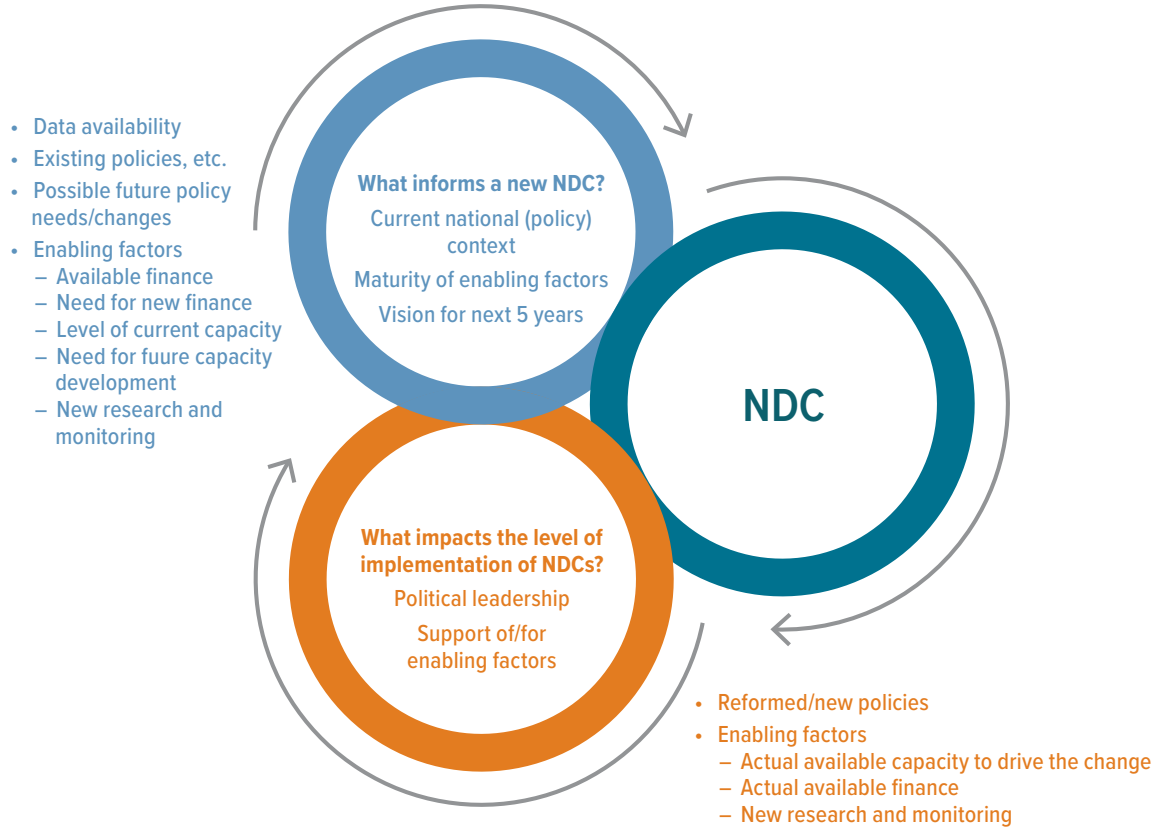
FIFTH PILLAR

Guidelines for Implementation: Delivering on Blue Carbon NDCS

NDCs should send clear, up-to-date signals to the global community every five years about a country's climate action ambition, and may also outline country planning priorities, capacity considerations and financing needs for successful implementation (Figure 4). Aligned with the requirement for NDCs to demonstrate progressive ambition, each NDC should reflect what a country can and will do, based on its own capacities, using existing and/or new policies and plans (known as unconditional targets), and many countries also communicate what they could do with additional support (known as conditional targets). Most NDCs just set the vision for what a country wants to achieve, so the NDC will need a variety of accompanying instruments to set a course for implementation, finance the NDC and communicate support needs or collaboration opportunities to the international community. These may include instruments like an NDC Implementation Plan, an NDC Financing & Investment Strategy, a National Climate Change Regulatory Framework or other regulatory frameworks specific to coastal wetlands, a Technology Needs Assessment, or an NDC Monitoring and Reporting plan.

For the NDCs to deliver meaningful progress, it is important that Parties consider the capacity, institutions and stakeholders needed to implement the NDC commitments, including those specific to blue carbon. To effectively meet the commitments of an NDC, consultation and collaboration with local stakeholders including IPLCs will be critical together with appropriate experts such as from coastal biodiversity, sustainable development fisheries, coastal management and tourism sectors.

FIGURE 4. Global and Regional Coordination for Blue Carbon NDCs



Coastal wetlands frequently span a diverse and complex regulatory landscape. Protection and/or restoration of coastal wetlands with climate mitigation and adaptation benefits will likely require engagement and collaboration from multiple ministries, agencies and departments. For example, management measures like spatial protection (i.e., Marine Spatial Planning), could be one element of a policy strategy. Other relevant policies and frameworks may need to be engaged or updated, especially those related to the land-sea interface (e.g., agricultural and watershed management, land-use development planning). Institutional arrangements and coordination mechanisms are important to achieve these outcomes.

For the stated ambition in NDCs to deliver meaningful progress, it is important that Parties consider the implementation implications of the commitments. Several aspects stand out:

1. **REGULATORY ALIGNMENT AND UPDATES.** As per previously described "readiness considerations", establishing NDCs within and alongside existing national processes, plans and policies will be fundamental to successful implementation. Policymakers updating and implementing NDCs with coastal wetlands should set out to establish consistency across significant measures concerning climate and/or development like national or subnational development plans, adaptation plans and communications, coastal zone management plans, National Biodiversity Strategies and Action Plans (NBSAPs) and beyond. Enhancing consistency and coordination across these measures can be essential for NDC implementation. For example, actions may be more likely to be undertaken if funded through national development plans and budget processes. Moreover, it is prudent to design updated NDCs that are mindful of the necessary legal and regulatory frameworks required to achieve targets. Additional regulatory frameworks might be needed. In Costa Rica, for example, their National Blue Carbon Strategy, launched in February 2023, calls for establishing, by 2025, official guidance and criteria for the registration of blue carbon projects—and to establish financial mechanisms for effective blue carbon ecosystems management. The strategy also calls for Costa Rica's Central Bank, by 2030, to develop and standardize a methodology for the economic evaluation of the benefits—including but not limited to carbon sequestration—that are provided by blue carbon ecosystems.

2. **CROSS-SECTORAL ENGAGEMENT.** NDCs do not exist in isolation—they must simultaneously align with other international and national priorities and existing legislation and policies. To achieve this, broader cross stakeholder coordination beyond intergovernmental coordination is needed. While this pertains to government, it also includes, for example non-government agencies and academia. The driving goal for a country seeking to recognize some or all the values (e.g., mitigation/adaptation) that blue carbon provides within an NDC revision process, is how best to ensure coastal wetlands are conserved, restored and sustainably managed and financed. Policymakers must therefore utilize NDCs to promote whole-of-government coordination and alignment around these activities. Close consultation and collaboration with experts from other policy fields, namely nature and biodiversity protection (e.g., CBD and Ramsar), fisheries and sustainable development (including SDG impact reporting) will be crucial.

3. **INTER-GOVERNMENTAL COORDINATION.** Embedding regulatory alignment within the relevant political architecture can be critical to ensuring the development of institutional memory. Inter-ministerial coordination structures, including institutional arrangements, that exist or will be necessary to create an effective structure for implementation should be designated. As coastal wetlands and measures protecting, restoring and/or regulating them are inherently interstitial, involvement from all relevant ministries, agencies and other policy-making groups should be coordinated.

4. **STAKEHOLDER BUY-IN.** Beyond policymakers, updated NDCs that include coastal wetlands can offer an opportunity to include all relevant stakeholders in the planning and implementation process. Relevant stakeholders can include local communities, Indigenous groups, local and international NGOs, academia, the private sector, among others. It will be important to design how these relevant stakeholders participate. Existing legislation related to these processes can serve as an enabling condition, however, it should be adjusted to reflect the specific circumstances of these stakeholders. Promoting institutional arrangements as part of this process could also help support stakeholder engagement.

5. **FINANCING.** Importantly, financial considerations are likely to be central in designing updated NDCs with an eye towards implementation planning. Costing the various activities related to coastal wetlands will be necessary for domestic budgetary processes and investment or financing plans. Countries may also consider adopting national and subnational policies that create financial incentives for protecting and conserving blue carbon ecosystems, such as payments for ecosystem services programs, etc. Commitments to the conservation, restoration and/or sustainable management of these ecosystems also serve as a signal to multiple potential avenues for financial support and development, including from international financing facilities like the Green Climate Fund and the Global Environment Facility.

BOX 8. Case Study: Implementation of Liberia's NDC Commitments

Liberia's NDC Journey

Liberia, located on the west coast of Africa, has significant blue carbon resources, particularly in its extensive mangrove forests. In 2021, Liberia submitted its updated NDC, setting ambitious mitigation and adaptation targets across its economy for 2030, with the support of the NDC Partnership. Liberia's NDC recognizes the importance of conserving and restoring blue carbon ecosystems as part of the country's climate mitigation efforts. Liberia has also set several implementation targets related to policy measures for the Coastal Zones sector, such as including mangroves in the next National GHG inventory, finalizing a National Wetlands Policy, promoting mangroves in the National REDD+ strategy, developing Marine Spatial Plans, and establishing community-based action groups to support the sustainable management of coastal and marine natural resources.

Liberia has also prepared an NDC Implementation Plan and NDC Financing and Investment Plan. The NDC Implementation Plan sets detailed intermediary steps and annual timelines to meet the mitigation and adaptation targets, maps out key government and civil society partners, estimates costs needed, as well as establishes Key Performance Indicators for monitoring and evaluation. This includes over 25 implementation actions for coastal zones and blue carbon ecosystems.

The Liberia Environmental Protection Agency and Ministry of Finance and Development Planning have continued to work through the NDC Partnership to mainstream climate change within key sustainable development policies and processes, and will be working with its seven coastal counties to develop climate-smart County Development Agendas aligned with the NDC targets in 2023. Recently, Liberia submitted a request for support to develop a national GHG inventory to assess the potential of blue carbon ecosystems in climate mitigation. They are currently seeking support partners in this key step to ensure the next NDC update will integrate blue carbon ecosystems in the GHG target.

Implementation Strategies

1. **Policy and Regulatory Frameworks:** Liberia has developed policies and regulations to support the conservation and restoration of blue carbon ecosystems. For example, the Forestry Development Authority (FDA) is responsible for managing and regulating mangrove forests and has established guidelines for sustainable mangrove management.
2. **Monitoring and Reporting:** Liberia is working to improve monitoring and reporting systems for blue carbon. This involves developing methodologies for measuring carbon stocks in mangroves and monitoring changes in forest cover over time. The data collected will be vital for tracking progress towards NDC targets and identifying areas for intervention.
3. **Institutional Capacity Building:** Liberia is investing in capacity building programs to enhance the technical and managerial skills of government agencies, local communities, and other stakeholders. Training programs on sustainable mangrove management, carbon accounting, and community-based conservation approaches are being conducted.
4. **Partnership and Collaboration:** Liberia is actively seeking partnerships and collaboration with international organizations, NGOs, and donor agencies to support the implementation of its NDC commitments. These partnerships provide technical expertise, financial resources, and knowledge-sharing opportunities.

Challenges for Implementing Liberia's NDC commitments for blue carbon

1. **Funding:** Limited financial resources pose a significant challenge to implementation. Securing funding for monitoring, research, community engagement, and restoration activities is essential for achieving NDC targets.
2. **Community Engagement:** Engaging local communities in sustainable mangrove management is crucial for the success of NDC implementation. However, it requires strong community partnerships, capacity building, and the recognition of local rights and tenure.
3. **Data Availability:** Lack of comprehensive data on carbon stocks, deforestation rates, and other relevant indicators hinders effective monitoring and reporting. Collecting and analyzing data is essential for informed decision-making and measuring progress.

The lessons learned from Liberia's NDC implementation for blue carbon include:

1. **Integration of Blue Carbon into National Policies:** Integrating blue carbon considerations into national policies and regulations is vital for long-term conservation and restoration efforts. This ensures that blue carbon is recognized and supported as a key strategy for climate mitigation.
2. **Building Partnerships and Collaboration:** Engaging with international organizations, NGOs, and donor agencies can provide valuable expertise, financial resources, and technical support. Collaborative efforts can help overcome capacity constraints and accelerate progress towards NDC targets.
3. **Community Involvement and Ownership:** Engaging local communities as key stakeholders and recognizing their rights and tenure is critical for sustainable management and restoration of blue carbon ecosystems. Empowering communities through capacity building and participatory decision-making processes enhances ownership and long-term success.

Conclusion

Liberia's NDC implementation for blue carbon is a significant step towards achieving its climate mitigation targets. Through policy frameworks, monitoring, capacity building, and partnerships, Liberia is working towards reducing deforestation and promoting the conservation and restoration of mangrove ecosystems. Overcoming challenges related to funding, community engagement, and data availability will be crucial for successful implementation. Ultimately, Liberia's efforts will not only contribute to climate change mitigation but also enhance the resilience of coastal communities and protect valuable blue carbon resources.

Dr. Vishnu Prahalad, University of Tasmania, installing HOBO water level loggers at NRM South's saltmarsh restoration site at Richmond Park Estate, Tasmania.

BOX 9. Guidance on accessing support for blue carbon in NDC implementation through the NDC Partnership

- The NDC Partnership brings together **more than 200 members**, including more than 120 countries, developed and developing, and more than 80 institutions to create and **deliver on ambitious climate action** that help achieve the Paris Agreement and the Sustainable Development Goals (SDGs).
- **Governments identify their NDC implementation priorities** and the type of support that is needed to translate them into actionable policies and programs. Based on these support needs, the membership offers a **tailored package of expertise, technical assistance, and funding**. This collaborative response provides developing countries with efficient access to a wide range of resources to adapt to and mitigate climate change and foster more equitable and sustainable development.
- These support needs can take the form of a **multi-year implementation framework**, sometimes called a Partnership Plan, or **individual requests to support urgent needs**.
- Countries can access **mitigation** and **adaptation** support from the Partnership's wider network of expert partners, across a range of services including:
  - Policy, Strategy and Legislation
  - Budgeting and Investment
  - Monitoring and Evaluation (M&E)
  - Capacity Building and Knowledge Products
- Blue carbon initiatives include, but are not limited to:
  - protecting and restoring ocean and coastal ecosystems;
  - covering coastal zones where sea and land processes occur; and
  - using the sustainable development of the ocean as an engine for sustainable economic growth (blue economy).
- Country requests for support to integrate blue carbon within NDC implementation efforts can cover various types of activities, including:
  - Developing studies and analysis
  - Preparing bankable projects and pipelines
  - Enacting and revising national strategies and plans
  - Enacting and revising policies and laws
  - Developing or updating M&E/MRV systems and collecting data
  - Developing capacity
  - Engaging stakeholders
  - Raising awareness and public education.
- Several examples exist of country requests for support to integrate blue carbon within a country's NDC implementation efforts. For example:
  - Tunisia requested support to design and implement an evaluation study to inform the Coastal Protection and Development Agency's (APAL) coastal adaptation action plan.
  - Liberia requested support to 'set up the foundational structures and extension services needed to increase aquaculture production to reduce the impact on marine fisheries'.
  - Seychelles requested support to design projects and financial plans using NbS to 'protect communities and vulnerable sites from the impact of climate change'.

For more information on the NDC Partnership and how to become a member, please visit www.ndcpartnership.org.

Chira island, Costa Rica — Mangrove and Fisheries conservation in the Palito community that depends on the mangroves. © Conservation International/photo by Marco Quesada

CONCLUSION
Looking Ahead

Coastal wetlands—mangroves, seagrasses, tidal marshes—are a unique triple value climate solution, simultaneously offering benefits in adaptation, mitigation and resilience. Through conservation, restoration and sustainable management of these ecosystems, countries have the opportunity to increase ambition towards achieving the Paris Agreement targets, build resilience along their coastlines and secure a future for coastal biodiversity, food security and livelihoods.

These guidelines provide technical direction for how countries can include coastal wetlands in their climate priorities and commitments through their NDCs, even for those countries with limited technical knowledge of the ecosystems scale or carbon value.

Explicitly including blue carbon ecosystems in NDCs (in the adaptation and/or mitigation section) can act as a strong indicator that a country is ready to implement blue carbon actions, or that they are ready to build capacity to implement blue carbon solutions. For instance, implementing and developing partners who might be able to provide assistance to countries in producing needed studies and analyses to include blue carbon in forest inventories, mapping or GHG inventories, would be alerted to these needs by the explicit mention of 'blue carbon' in a country's NDC.

NDCs are essentially national planning documents and the presence or absence of certain language (such as reference to blue carbon terms) sends strong signals to domestic policy instruments. Because blue carbon often straddles several sectors (forestry, coasts, agriculture), including specific reference to blue carbon ecosystems in an NDC could help sectors increase their cross-sectoral coordination over time for better management of these ecosystems.

It is expected that with an expanding number and diversity of countries including blue carbon ecosystems for adaptation and mitigation in their NDCs, additional technical challenges and opportunities will be identified. Consequently, these guidelines have been and will continue to be revised and expanded over time to address these future challenges.

Once blue carbon ecosystems have been included in a country's NDC, the essential next step is implementing policies and actions to achieve those commitments. These actions will be highly varied, based on national circumstances and the stakeholders involved. In some countries, local and Indigenous communities will lead site specific actions. In other countries, market-based carbon crediting may be able to support financing for blue carbon ecosystem restoration, and it is critical that these crediting projects optimize outcomes for communities, nature and the climate equitably and transparently.[50] In many locations, national coastal policy could provide a mechanism for achieving NDCs. In all cases, inclusion of blue carbon ecosystems in NDCs clearly states a commitment to these actions and hence will accelerate the financing, policy and science needed to achieve high-quality conservation and restoration outcomes. Blue carbon ecosystems link local communities with national climate targets, global climate change with unique and endemic coastal species and the UNFCCC with the front lines of the impacts of a changing ocean and atmosphere. Efforts to raise climate ambition through the inclusion of blue carbon ecosystems and to support implementation of NDC commitments is fundamental to achieving global climate, biodiversity and sustainable development goals.

50 Meridian Institute (2022). High Quality Blue Carbon Principles and Guidance: A Triple-Benefit Investment for People, Nature, and Climate. https://merid.org/wp-content/uploads/2022/11/HQBC-PG_FINAL_11.8.2022.pdf.

APPENDIX 1
Readiness-Assessment Exercise

"Blue carbon readiness assessment" is the exercise that follows the tentative decision—made in accordance with the decision tree shown in Figure 2 above—to include blue carbon in NDCs.

Working through this readiness assessment helps policymakers identify both the engagement level at which blue carbon integration within a specific NDC is most appropriate and the nature and level of ambition of any specific commitments to be made. "Readiness assessment" is best understood as a continuous or circular process to support the 'ratchet' or ambition mechanism whereby each NDCs is required to be progressively ambitious and should facilitate increased progress from one NDC update to the next.

The blue carbon readiness assessment consists of three core themes or areas: (1) institutions and stakeholders, (2) information gathering, and (3) NDC design:

1. **INSTITUTIONAL AND STAKEHOLDER ANALYSIS:** Identify blue carbon relevant roles, responsibilities and policies

   - Which entities (government, research, NGO, private sector, others) have a role related to coastal ecosystems? Guiding questions:
     - Which governmental agencies are responsible for management of these ecosystems or part of these ecosystems? For example, are these ecosystems managed through environmental development approvals, or for fisheries?
     - Are there research institutions that have undertaken studies or monitoring of these ecosystems?
     - Does the private sector have any data or undertake any management actions? For example, port developers often undertake environmental assessments of these ecosystems.

   - Bring identified entities together for coordination and consideration of steps 1–3 and maintain involvement for NDC design and implementation.
     - Initially, a broad group can be convened including the main institutions holding relevant blue carbon data, stakeholders active in blue carbon ecosystems and agencies responsible for coastal policies.
     - Subsequently, a smaller working group might develop input into an NDC.

2. **INFORMATION GATHERING:** Bring together as many of the above entities as possible to discuss coastal ecosystems including:

   - Blue carbon data and information:
     - **Key question:** What data and information is available?
     - **Why:** Information on the location, extent and condition of the blue carbon ecosystems in a country is needed to evaluate whether and how to include these ecosystems in an NDC.
     - **Specific data that may be needed, depending on the pathway for blue carbon in an NDC:**
       - Coastal ecosystems value: it is well established globally that blue carbon ecosystems are important for protecting coastlines, storing carbon and supporting fisheries and livelihoods. To establish how significant these ecosystems are for a specific country, one may consider the extent of these ecosystems and the importance of industries that depend on these ecosystems, such as coastal fisheries, for your economy. One could also look for data related to mitigation and adaptation.

    - Coastal ecosystems for mitigation: To understand the mitigation value of your blue carbon ecosystems you will need to understand how much carbon is stored in these ecosystems and the distribution of these ecosystems. For example, mangroves in tropical areas tend to store more carbon than mangroves in arid areas. Larger areas of mangroves have higher potential mitigation value. Mangrove areas that have been (or are threatened by) significant rates of degradation represent potential mitigation benefits to an NDC if degradation can be reversed or slowed.
    - Coastal ecosystems for adaptation: To understand the adaptation value of blue carbon ecosystems, data needed includes the extent of coastline, the coastline's vulnerability to storms and flooding and the proximity of communities to the coastline.

- Drivers of blue carbon ecosystem degradation:
    - **Key question:** Are blue carbon ecosystems being impacted by any activities and can you quantify the type and extent of degradation or conversion?
    - **Why:** It is important to understand if and why your ecosystems are under threat. Including coastal wetlands in your NDC could help drive coordination and policy efforts to better manage the wetlands.
    - **More detail:** Drivers of degradation and loss vary with geography and local conditions but can include: clearing for development (ports, tourism, houses); cutting for firewood or building materials; aquaculture or agriculture. Can these impacts be quantified over time and/or the likely future impacts estimated?

- Policies and regulations:
    - **Key question:** What policies and regulations are in effect that manage, regulate or impact coastal ecosystems?
    - **Why:** You need to understand if you have policies and regulations in place, or that could be developed, that can be leveraged to better manage these ecosystems, particularly if you would like to harness their mitigation potential. From an adaptation perspective, it is also important to understand this to manage these ecosystems to protect shorelines and support fisheries and livelihoods.
    - **More detail/considerations:** For example, is it a requirement to undertake environmental impact assessments prior to development? Are there protected areas in place for some/all coastal ecosystems?

3. LOOKING FORWARD

- Risks:
    - **Data:** Finding information on coastal wetlands can be challenging but with an understanding of what is available you can identify a blue carbon pathway appropriate for your country NDC. You need sufficient data to be able to understand and manage your ecosystems under the pathway outlined and you need to be able to track progress over time. Higher tiers of data are necessary for different pathways. For example, if you develop a quantitative target (e.g., to increase mangrove coverage by 10 percent), you need to be able to estimate the mangrove coverage at the start of the reporting period and at the end. If you outline that you will protect coastal ecosystems for adaptation purposes, it is worthwhile identifying how those ecosystems support that goal.
    - **Drivers of degradation:** If you don't have an understanding of the drivers of degradation, you risk underestimating the potential impact they might have on your ecosystems and hence on your NDC.
    - **Policies:** If you do not have sufficient policies and regulations to manage your ecosystems, you also risk effectively managing the ecosystems and hence of achieving your NDC.

- Projections:
    - Where possible, it is helpful to consider available data and trends and policy and regulation levers to estimate the likely state of your coastal wetlands into the future and over the NDC period. At a basic level, key stakeholders may be able to indicate whether it is possible to

manage degradation rates or threats to ecosystems through current policies or regulations. Consider also the economic pressures in your context. If stakeholders or data predicts continued degradation, you will need to balance the potential to use the NDC to incentivize action and drive better policy and regulation impacts, against potentially outlining too ambitious a goal in your NDC.

- Managing the gaps identified through development of data, processes, systems, people and policies:
  - The readiness exercise is a good opportunity to identify gaps in the management of coastal wetlands and begin considering how to address these limitations and simultaneously increase the coverage of these ecosystems in the NDC process over time.

APPENDIX 2
Data – A Starting Point

There are a few sources that may be useful in establishing where a country may have coastal wetland ecosystems, including estimates of carbon stored there. They could be used as Tier 1 baseline carbon estimates for inventory purposes but will need to be validated because:

- They are values derived from the global application of a model, the inputs of which may or may not be regionally or locally relevant.
- They represent a specific point in time that (a) is not the baseline year and/or (b) do not reflect current land-use patterns at the local level within a time series.

1. Coastal Carbon Atlas hosted by the Smithsonian Environmental Research Center. The atlas is based on a clearinghouse of blue carbon data made publicly available. https://ccrcn.shinyapps.io/CoastalCarbonAtlas/
2. Global mangrove soil carbon: dataset and spatial maps (2017) https://dataverse.harvard.edu/dataset.xhtml?persistentId=doi:10.7910/DVN/OCYUIT
    a. Read – Sanderman J, Hengl T, Fiske G et al. (2018) A global map of mangrove forest soil carbon at 30 m spatial resolution. Environmental Research Letters 13: 055002. doi: 10.1088/1748-9326/aabe1c
3. Global Distribution of Mangroves USGS (2000): https://data.unep-wcmc.org/datasets/4
    a. Read – Giri C, Ochieng E, Tieszen LL, Zhu Z, Singh A, Loveland T, Masek J, Duke N (2011). Status and distribution of mangrove forests of the world using earth observation satellite data (version 1.3, updated by UNEP-WCMC). Global Ecology and Biogeography 20: 154–159. doi: 10.1111/j.1466-8238.2010.00584.x
4. The Dryad database—publishes datasets for plant related papers, including mangrove; consider wood density, mortality and growth etc.: https://datadryad.org/stash/
5. See list of global datasets included in the 2019 Refinements, Volume 4, Chapter 3 Annex 3A.1 (CHAPTER 1 (iges.or.jp))
6. The United Nations Environment — World Conservation Monitoring Centre (UNEP-WCMC) (http://data.unep-wcmc.org/).

    Check GEDI products page — https://gedi.umd.edu/data/products/ Caution: This data may not be inventory ready but worth checking as another source of data for above ground biomass, especially for mangroves.
7. Global Mangrove Watch (GMW) is an online platform that provides remote sensing data and tools for monitoring mangroves. It gives universal access to near real-time information on where and what changes there are to mangroves across the world, their carbon stocks, international status and highlights why they are valuable. https://www.globalmangrovewatch.org

General Support

8. The IPCC also has a Support Page that features a series of PowerPoint presentations available that discuss various aspects of implementing the 2006 Guidelines, including on the software available through the IPCC that may be useful, discussion on data collection and on treating uncertainty: https://www.ipcc-nggip.iges.or.jp/support/support.html
9. The IPCC inventory software page is at: https://www.ipcc-nggip.iges.or.jp/software/index.html

GLOSSARY OF TERMS

This document uses the term **'blue carbon'** in line with the usage by the Intergovernmental Panel on Climate Change (IPCC) in its Special Report on the Ocean and Cryosphere in a Changing Climate (2019):

Blue carbon means vegetated coastal ecosystems, in particular coastal wetlands such as mangroves, tidal salt marshes and seagrass meadows.

For the purpose of this guidance document, the term 'blue carbon' is interchangeably used with **'coastal wetlands'**, i.e., "wetlands near the coast that are influenced by tidal and/or saline or brackish water. They may consist of mangrove, tidal salt marsh and seagrass vegetation and can have organic and mineral soils," as defined by the IPCC Wetlands Supplement.

Other Terms Used in the Guidance Document

AFOLU "**Agriculture, forestry and other land use**" as defined by the IPCC in the 2006 guidelines for greenhouse gas inventories. AFOLU refers to all emissions and removals from/by soils and vegetation (also covered with the term "LULUCF", see below) as well as non-soil related agricultural emissions (such as emissions from livestock and fertilizer use).

BR "**Biennial Reports**" or "**BRs**" are reporting tools under the Convention relevant for those countries listed in Annex I of the Convention, i.e., mostly industrialized countries. BRs must be submitted every two years (the first was due in 2014). BRs are meant to assess the national data—including inventory data—against principles of consistency, transparency, comparability and completeness.

BTR "**Biennial Transparency Reports**" or "**BTRs**" are common reporting tools applicable to all Parties of the Paris Agreement. BTRs identify key categories of emissions, ensure time-series consistency, provide completeness and uncertainty assessments, as well as quality control. The first BTRs are due in 2024. They must follow recent (2006) IPCC Guidelines. The use of the 2013 Supplement on Wetlands is encouraged, but not obligatory. BTRs will replace BRs and BURs under the Paris Agreement.

BUR "**Biennial Update Report**" or "**BURs**" are reporting tools under the Convention relevant for those countries not listed in Annex I of the Convention, i.e., mostly developing countries. BURs provide an update of the information presented in National Communications (NC), in particular on national GHG inventories, mitigation actions, constraints and gaps, including support needed and received. The first BUR should have been submitted by December 2014, or consistent with the Party's capabilities or level of support, and every two years thereafter as a summary of their NC or a stand-alone report.

CBD **Convention on Biological Diversity,** as adopted in 1992 (Nairobi) and as entered into force in 1993.

CMA The term refers to the Conference of the Parties, the supreme body of the Convention, when it serves as the meeting of the Parties to the Paris Agreement ("**Conference of the Parties serving as the meeting of the Parties to the Paris Agreement**" or "**CMA**"). It is the main decision-making body within the Paris Agreement.

Convention The term refers to the "**United Nations Framework Convention on Climate Change**" (also referred to as "**UNFCCC**") of 1992.

CTU	Information necessary for "**clarity, transparency and understanding**" (often referred to as "**CTU**" or "**ICTU**"), a concept laid out in the Paris Agreement to inform, among others, the design of NDCs
EbA	"**Ecosystem-based Adaptation**" or "**EbA**" uses the range of opportunities for the sustainable management, conservation and restoration of ecosystems to provide services that enable people to adapt to the impacts of climate change.
IPCC	"**Intergovernmental Panel on Climate Change**" or "*IPCC*" refers to the body with the objective to provide governments at all levels with scientific information that they can use to develop climate policies.
LDCs	**Least Developed Countries**—a UN list of low income countries that in the context of the UNFCCC have specific exceptions and rights.
LULUCF	"**Land Use, Land Use Change and Forestry**" or "**LULUCF**" refers to the human activities, through land use, land-use change and forestry (LULUCF) activities, that affect changes in carbon stocks between the carbon pools of the terrestrial ecosystem.
MPA	"**Marine Protected Area**". It has specific meanings under domestic legal systems. For the purpose of the CBD, however, an MPA is defined as an area within or adjacent to the marine environment, together with its overlying water and associated flora, fauna, historical and cultural features, which has been reserved by legislation or other effective means, including custom, with the effect that its marine and/or coastal biodiversity enjoys a higher level of protection than its surroundings.
NbS	"**Nature-based solutions**" or "**NBS**" are 'actions to protect, conserve, restore, sustainably use and manage natural or modified terrestrial, freshwater, coastal and marine ecosystems, which address social, economic and environmental challenges effectively and adaptively, while simultaneously providing human well-being, ecosystem services and resilience and biodiversity benefits.' This definition was adopted by the Fifth Session of the United Nations Environment Assembly (UNEA-5) in its 'Resolution on Nature-based Solutions for Supporting Sustainable Development'.
NCS	"**Natural climate solutions**" or "**NCS**" are activities that increase climate change mitigation from nature, such as conservation, restoration and land management and may also include adaptation benefits of these activities.
NDC	A "**Nationally Determined Contribution**" or "**NDC**" documents national efforts towards achieving the objectives of the Convention, as submitted by a Party in accordance with the rules of the Paris Agreement.
Party	A party to the Convention or a party to the Convention and the Paris Agreement.
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**" (collectively referred to as "**REDD+**" is a framework guiding developing countries efforts to reduce emissions from deforestation and forest degradation and foster conservation, sustainable management of forests and enhancement of forest carbon stocks.
SIDS	The term "Small-Island Development States" or "SIDS" refers to a collection of island states across the globe that for their vulnerability to climate change and relatively how-developed capacities have granted specific rights and liberties under the UNFCCC.
SOC	**Soil Organic Carbon**

Marsh, Karanambu. © Conservation International/photo by John Martin

Conservation International

International Blue Carbon Institute

International Partnership for Blue Carbon

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NDC Partnership

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