



Coastal blue carbon ecosystems

Opportunities for Nationally Determined Contributions.
Policy brief

D. Herr, E. Landis



CONSERVATION
INTERNATIONAL



Blue Climate
Solutions
A project of The Ocean Foundation

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blue
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Comments and reactions to the paper are very welcome.

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Established in 2008, Blue Climate Solutions is a non-profit project of The Ocean Foundation, and is the world's first organization with a sole focus on blue carbon. We promote measurement and valuation of oceanic carbon services to enable development of policies that recognize the climate change mitigation and adaptation roles of the oceans, their ecosystems and inhabitants. www.bluecsolutions.org

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GRID-Arendal is a Norwegian foundation and a centre collaborating with the United Nations Environment Programme (UNEP), supporting informed decision making and awareness-raising. www.grida.no

About The Blue Carbon Initiative

The Blue Carbon Initiative is the first integrated program with a comprehensive and coordinated global agenda focused on mitigating climate change through the conservation and restoration of coastal marine ecosystems. The Initiative currently focuses on mangroves, tidal marshes and seagrasses. The Blue Carbon Initiative brings together governments, research institutions, non-governmental organizations and communities from around the world. <http://thebluecarboninitiative.org>

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The UNEP/GEF Blue Forests Project is a global initiative focused on harnessing the values associated with coastal marine carbon and ecosystem services to achieve improved ecosystem management. The project is implemented by the United Nations Environment Programme (UNEP) with partners worldwide and addresses key 'blue forests' knowledge gaps, as well as providing experience and tools to help ensure greater global application in the future. <http://www.gefblueforests.com/>

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1 Blue Carbon and NDCs. Purpose and context of this paper



This policy brief examines the existing Intended Nationally Determined Contributions (INDCs) and ratified National Determined Contributions (NDCs) with regard to the inclusion of specific efforts addressing blue carbon ecosystems, namely mangroves, tidal saltmarshes and seagrasses, as climate mitigation or adaptation solutions.

Prior to and during the 21st Conference of the Parties (COP) to the United Nations Framework Convention on Climate Change (UNFCCC), 163 INDCsⁱ have been submitted and 81 Parties have submitted their NDC^{1,2}. The INDCs are meant to outline Parties' fair and ambitious contributions to addressing climate change and achieving the objective of the Convention as set out in its Article 2 and further strengthened in Article 2 of the Paris Agreement. Amongst other information, Parties were requested to include information on the scope and coverage

ⁱ In this number, the individual Member States of the European Union (EU) are all represented by a single NDC. In this paper, each EU Member State is treated individually.

of their mitigation and adaptation efforts, as well as on methodological approaches including those for estimating and accounting for anthropogenic greenhouse gas emissions and removals.³

As part of the Paris Agreement, Parties are now committed to regularly submit revised NDCs every 5 years, with a review process that is intended to continually increase ambition (Art 4.3 and 4.9 of the Paris Agreement). For the time being, the INDCs submitted by a country prior and during COP21 will automatically count as its first NDC when the country ratifies the Paris Agreement, unless decided otherwise.⁴

While the current NDCs are a significant contribution, the existing commitments will not reach the 2°C target necessary to combat climate change. Scientists have calculated that the NDCs collectively will lower greenhouse gas (GHG) emissions but will still allow for a warming of 2.6–3.1 degrees Celsius by 2100.⁵ This reality is recognized in the Paris Agreement, and this policy brief aims to highlight the opportunity for countries to consider nature-

based solutions beyond what was originally submitted, including recognizing blue carbon as an opportunity to fill this emissions gap.

This brief outlines how Parties have up until now included and addressed the management of coastal wetland (blue carbon) ecosystems in their NDC climate mitigation and adaptation solutions to date. It also offers a short outlook on areas where coastal wetlands contributions can be improved and strengthened in the future, allowing for more ambitious NDC

submissions. In many coastal nations these ecosystems provide a significant mitigation and adaptation value, as a carbon sink and as coastline protection and food security, respectively. Thus, the inclusion of coastal ecosystems can be considered an important asset in a more ambitious revision of the NDC for many Parties.

Highlights:

151 countries contain at least one blue carbon ecosystem (seagrass, saltmarshes or mangroves) and 71 countries contain all three.

Inclusion in NDCs

- 28 countries' NDCs include a reference to coastal wetlands in terms of mitigation
- 59 countries include coastal ecosystems and the coastal zone into their adaptation strategies. This can be viewed as an opportunity to include relevant activities in blue carbon ecosystems (mangroves, saltmarshes and seagrasses) for mitigation ambitions, if relevant and as appropriate

Noting this, there is a significant opportunity to include and expand blue carbon ecosystems clearly into the mitigation section of future, revised NDCs of all coastal countries. Overall the climate mitigation opportunity of blue carbon ecosystems shows as:

If half of the annual coastal wetlands loss was halted, emissions would be reduced by a 0.23Gt CO₂ yr⁻¹. This is equivalent to offsetting the 2013 emissions of Spain.

If coastal wetlands were restored to their 1990 extent, it would have the potential to increase annual carbon sequestration 160Mt CO₂ yr⁻¹ which is the equivalent to offsetting the burning of 77.4 million tonnes of coal.

2 Introduction

2.1 The Paris Agreement and Nationally Determined Contributions

The Paris Agreement was adopted by all 196 Parties to the UNFCCC at COP21 in December 2015. This landmark agreement marked a turning point with nations now striving for a low-carbon economy using innovation in technology, energy, finance, and conservation sectors. The Agreement entered into force on November 4th 2016,⁶ less than one year since its adoption. This is considered extremely fast for an international treaty and signals the overall sense of urgency to address climate change.⁷

One of the most important elements of the Paris Agreement is that countries can independently decide how to lower their emissions through its Nationally Determined Contributions (NDCs). These national level climate action and emissions reduction plans are prepared to reflect countries economic and environmental differences. Each successive NDC is to represent a progression from the previous one, representing the highest possible ambition (Art. 4.3 of the Paris Agreement) and each party shall communicate a revised NDC every five years (Art 4.9 of the Paris Agreement). One of the principles that will be applied to ensure enhanced ambition of these commitments over time includes the principle of “no backsliding.” While it is a non-legal aspect of the Agreement, it indicates that the current level of ambition is the baseline, and that for each review period countries should increase their ambition accordingly.

2.2 Using nature to support climate change mitigation and adaptation.

The contribution of conservation and restoration of ecosystems to climate change mitigation and adaptation are often referred to as nature-based solutions for climate change⁸ or natural climate solutions.⁹ Sustainably managing natural

extractive resources and agricultural lands along with restoring natural or modified ecosystems and conserving the intact systems offer opportunities to address the societal challenges of climate change. Simultaneously these actions provide human well-being and biodiversity co-benefits.¹⁰

Parties can develop their NDC mitigation actions and priorities based on a portfolio of measures including nature-based solutions. The role of ecosystems has been integrated in the UNFCCC since its adoption in 1992, in Art 4.1(d), when referring to the commitments of Parties in the Convention when “taking into account their common but differentiated responsibilities and their specific national and regional development priorities, objectives and circumstances.”¹¹

Promote sustainable management, and promote and cooperate in the conservation and enhancement, as appropriate, of sinks and reservoirs of all greenhouse gases not controlled by the Montreal Protocol, including biomass, forests and oceans as well as other terrestrial, coastal and marine ecosystems;

As well as the need to address coastal areas through appropriate coastal zone management, in Art 4.1(e):

Cooperate in preparing for adaptation to the impacts of climate change; develop and elaborate appropriate and integrated plans for coastal zone management, [...].

The Paris Agreement reiterates ‘the importance of the conservation and enhancement, as appropriate, of sinks and reservoirs of the greenhouse gases referred to in the Convention’ (Art.5.1) and ‘noting the importance of ensuring the integrity of all ecosystems, including oceans, and the protection of biodiversity’ (preamble).

A significant nature-based solution comes from the Land Use, Land Use Change and Forestry (LULUCF) sector. Within this context and specific to the LULUCF sector as part of the UNFCCC, the role of coastal and marine ecosystems for climate mitigation, especially mangroves, has been described over the last couple of years.^{12,13}

Other papers have already looked at NDCs in the context of nature-based solutions. Laurans et al. 2016¹⁴ for example, indicated that 40 NDCs “have placed nature-based solutions in a highly visible position. Most NDCs still fall very short of truly coherent mitigation and adaptation policy programs. The diversity and heterogeneity of the commitments made by the different countries mean that the question of the effective organisation of policies capable of implementing these commitments is still unresolved.”

2.3 Coastal blue carbon. Mitigation and adaptation benefits

Conservation and restoration of coastal ecosystems, specifically tidal salt marshes, seagrass meadows and mangrove forests, are excellent examples of nature-based solutions for climate mitigation and adaptation. These coastal ecosystems sequester and store huge amounts of carbon from our atmosphere, and are often referred to as blue carbon ecosystems. Coastal wetlands draw in carbon as they grow and transfer much of this into the rich organic soils held by their roots.¹⁵

Mitigation

Unlike terrestrial soils, the soils of blue carbon ecosystems are largely anaerobic (without oxygen). This means that the carbon incorporated into the soils decomposes very slowly and can be stored for hundreds or even thousands of years.¹⁶ Additionally, the high salinity in many blue carbon systems limits methane production, a potent GHG.¹⁷

Unlike their terrestrial and freshwater counterparts, blue carbon systems do not become saturated with carbon because

sediments accrete vertically in response to rising sea level, when ecosystem health is maintained.¹⁸ Therefore, the rate of carbon sequestration and the size of the carbon sink may continue to increase over time.

Adaptation

Coastal wetlands play a unique role in protecting coastlines from the increasing impacts of climate change by absorbing incoming wave energy, providing storm surge protection, and preventing erosion. In some cases, coastal wetlands have proven to be more cost-effective than hard infrastructure like seawalls and levees, as they require less maintenance and may keep pace with sea level rise.^{19,20} Protecting coastal wetlands also comes with a suite of other co-benefits such as spawning grounds for commercial fish, water purification, and local livelihoods.

Climate impacts of coastal wetland losses

Wetlands are being lost at an alarming rate—faster than almost any other habitat on Earth—primarily due to human activity. It is estimated that the amount of CO₂ released annually from degraded or lost wetlands is equivalent to the annual emissions of the United Kingdom.²¹ Losing these systems also means high risks of severe flooding and coastal erosion, thus increasing the vulnerability of millions of people living along the world's coastline.^{22,23} Thus, it is essential and urgent that we protect and restore the world's blue carbon systems.

2.4 Blue carbon opportunities to increase ambitions

Avoiding coastal wetland conversion is a cost-effective climate solution. Many interventions such as establishing protected areas, improving land tenure, and enforcing land-use laws can be put into place immediately and yield significant climate benefits. If we stopped loss of coastal wetlands today, we could prevent the release of over 0.45 Gt CO₂ per year.

Realistically, if we halted half of annual loss using interventions mentioned above, we would reduce emissions by a 0.23 Gt CO₂

per year. This is equivalent to offsetting the 2013 emissions of Spain.²⁴

Another significant opportunity for coastal wetlands is restoration. If coastal wetlands were restored to their 1990 extent, it would have the potential to increase annual carbon sequestration by 160Mt CO₂ yr⁻¹ or roughly equivalent to offsetting the burning of 77.4 million tonnes of coal.²⁵ Additionally, it is estimated that it only takes 100 meters of mangroves to reduce wave height by 66%, providing a significant adaptation benefit.²⁶

The loss of coastal habitats is often driven by development, which engenders sustainable development and environmental

integrity challenges. The re-establishment of natural areas often means removing or abandoning existing development and related activities (such as aquaculture). Such initiatives require community support as well as providing economic alternatives for those communities affected. One example is that restoring coastal wetlands will increase fish populations and other extractive resources and could provide jobs as a viable alternative.



TABLE 1. DIFFERENT NDC CATEGORIES OF BLUE CARBON EFFORTS

Action Type	Countries			
Mitigation				
LULUCF and Forestry Countries that include coastal wetlands as part of LULUCF and other forest commitments	Angola Australia Bahamas Bangladesh Brunei	El Salvador Guinea Haiti Iceland Philippines	Senegal Sri Lanka Suriname USA	
General Mitigation Countries that include coastal wetlands as part of general mitigation aims	Antigua and Barbuda Bahrain Belize China	Cook Islands Comoros Ecuador Guyana Kiribati	Marshall Islands Mexico Saudi Arabia Seychelles UAE	
Adaptation				
Conservation, Protection and Reforestation Countries that include coastal wetlands a adaptation solutions, with references to conservation and management, protection, and reforestation measures	Bahamas Bahrain Bangladesh Belize Benin Cameroon Cape Verde Congo, the Republic of Cook Islands Cote d’Ivoire Cuba Djibouti Dominican Republic Ecuador	Egypt Fiji Gabon Gambia Grenada Guinea- Bissau Guyana Haiti Honduras India Lebanon Liberia Madagascar Marshall Islands	Mauritius Mexico Morocco Myanmar Nauru Niue Oman Philippines Saint Lucia Saint Vincent and the Grenadines Saudi Arabia Senegal Seychelles Singapore	Somalia South Africa Sri Lanka Sudan Suriname Tanzania Thailand Togo Uruguay Venezuela Vietnam
Coastal Zone Management Countries that include information and make specific references to planning tools, such as Integrated Coastal Zone Management (ICZM)	Bangladesh Belize Cambodia Cameroon Egypt Eritrea	Gabon Gambia Georgia Grenada Guatemala Haiti	India Liberia Malaysia Morocco Myanmar	Niue Saint Lucia Saudi Arabia Sudan Vanuatu
Fisheries Countries that include information and/or see the need to prioritize adaptation in job-generating sectors using coastal and marine resources (e.g. fisheries)	Bahamas Belize Brunei Cambodia Cameroon	Cape Verde Costa Rica Djibouti Haiti	Jamaica Mauritius Nigeria Oman	Saint Lucia Sierra Leone Tanzania Vietnam
Other				
Countries that use the term blue carbon	Bahrain Philippines	Saudi Arabia Seychelles	UAE	
Countries that specifically recognize both the mitigation and adaptation benefits of coastal wetlands	Antigua and Barbuda Bahrain Belize Cook Islands	Madagascar Marshall Islands Mexico Philippines St Lucia	Saudi Arabia Suriname Togo	

3 Blue carbon ecosystems in Nationally Determined Contributions. An overview

This document provides an overview of the existing NDCs to date and how blue carbon is addressed. This compilation resource is a valuable tool for countries with blue carbon ecosystems to use as a reference point in consideration of revised NDCs and implementation of the Paris Agreement.

“Blue Carbon” is not an official term, category, or activity under the UNFCCC or related guidance (e.g. IPCC Wetlands Supplement). However, some countries have used the term “blue carbon” in their NDC submission. Given the lack of official standing and definition of blue carbon within the UNFCCC, the commitments made by these countries when referencing “blue carbon” in some cases could use further description and detail for implementation and broader understanding (e.g. does blue carbon refer to the mitigation potential, or does blue carbon refer to the three coastal carbon ecosystems—mangroves, seagrasses, and saltmarshes—and their broader benefits, including adaptation).

It is important to note that many countries refer to coastal ecosystems, or the coastal zone in general, without using the term blue carbon or highlighting specific coastal ecosystems. In some cases, this may include coral reefs or bivalve ecosystems that are not considered coastal blue carbon ecosystems given their lack of mitigation potential. The report does not include

countries that may have domestic programs or other international commitments that include blue carbon, but do not explicitly state these in their NDCs (see section 4).

3.1 Climate Mitigation

Coastal wetlands as part of LULUCF and other forest commitments

Human activities in coastal wetland ecosystems, whether leading to the sequestration and storage of carbon and acting as carbon sinks (e.g. through conservation efforts), or leading to GHG emissions and acting as carbon sources (e.g. through shrimp farms), can and should be included in countries’ climate change mitigation efforts, and national GHG reports, respectively.

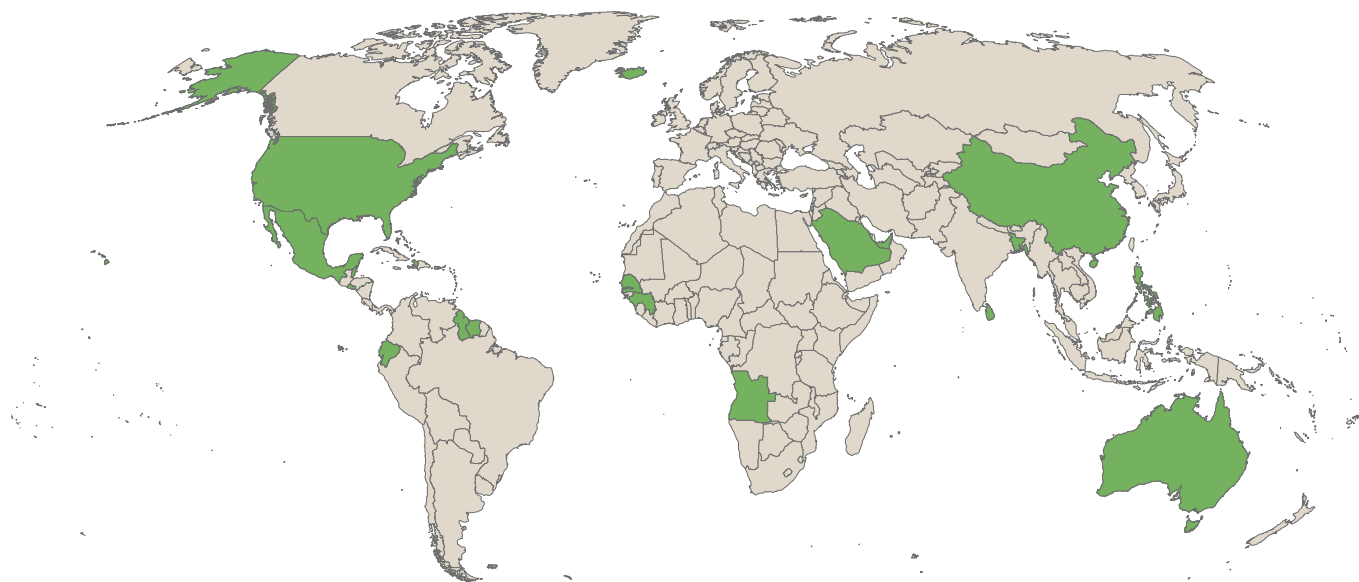
Depending on a country’s national definition of ‘forests’, mangroves may be included in its overall forestry related activities, including Afforestation / Reforestation (A/R) or Reducing Emissions from Deforestation and Forest Degradation (REDD+). Typically, countries talk about “forests” within the context of natural climate solutions for mitigation, without listing specific activities for individual forest types.

Land Use, Land-Use Change and Forestry (LULUCF) is a GHG inventory sector for countries to quantify and account for the emissions and removals of GHGs from terrestrial lands. Depending on a country’s

BOX 1. WHAT ARE COASTAL WETLANDS?

The 2013 IPCC Wetlands Supplement writes: “Coastal wetlands generally consist of organic and mineral soils that are covered or saturated, for all or part of the year, by tidal freshwater, brackish or saline water and are vegetated by vascular plants. The boundary of coastal wetlands may extend to the landward extent of tidal inundation and may extend seaward to the maximum depth of vascular plant vegetation. Countries need to develop a nationally appropriate definition of coastal wetland taking into account national circumstances and capabilities. The coastal chapter (chapter 4) refers specifically to tidal freshwater and salt marshes, seagrass meadows, and mangroves”.

MITIGATION



Angola **Antigua and Barbuda** Australia **Bahamas** Bahrain **Bangladesh** Belize **Brunei** China
Comoros Cook Islands **Ecuador** El Salvador **Guinea** Guyana **Haiti** Iceland **Kiribati**
Marshall Islands **Mexico** Philippines **Saudi Arabia** Senegal **Seychelles** Sri Lanka **Suriname**
United Arab Emirates United States of America

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BOX 2. IPCC WETLANDS SUPPLEMENT

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.

IPCC (Intergovernmental Panel on Climate Change). 2014. 2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands, Hiraishi T, Krug T, Tanabe K, Srivastava N, Baasansuren J, Fukuda M, and Troxler TG. (eds). Published: IPCC, Switzerland.

definition of terrestrial land, this may include coastal wetlands. The IPCC has issued guidance on including coastal wetlands but it is not mandatory (see Box 2). While many countries address LULUCF and REDD+ activities in their NDCs, reviewing these submissions does not give a clear indication whether coastal wetlands are actually included or not, unless a country specifies the ecosystem.

Africa

Angola in its LULUCF description, includes mangrove and wetlands. Afforestation and Reforestation of degraded forest lands and mangrove habitats have a strong potential for mitigation purposes and are part of Angola's Forest Carbon Options.

Brunei includes mangroves as mitigation contributions from the Forestry and Land Use Sectors, as they sequester carbon dioxide from the atmosphere.

The **Republic of Guinea** will reduce the anthropogenic deforestation pressures on mangroves (i.e. intensification of existing rice agriculture and alternative technologies to reduce wood as an energy source) to foster sustainable management and a more systematic reforestation effort, as part of a revised mangrove management plan (*schéma directeur d'aménagement de la mangrove* (SDAM)).

Senegal identifies mangrove restoration as a key part of their forestry activities. Specifically, Senegal commits to protecting and restoring 4,000 ha of mangrove each year starting in 2017.

Americas

The **Bahamas** discusses its Forestry Act, which allows for dedicated management areas, which will be subject to a management plan for environmental conservation. Proper management is expected to improve the functionality of their mangrove ecosystems and increase their carbon sink ability. The Bahamas may be considered for inclusion in REDD+ activities, pending further study.

El Salvador has a goal to establish and manage one million ha of forest, including mangroves.

Guyana Includes mangroves in its Avoided Deforestation section under the Emission Reduction Programme.

Haiti, in terms of mitigation, commits to protect, conserve and enlarge 19,500ha of mangrove forests from now until 2030.

Suriname, under its Forest Mitigation section, highlights its Readiness efforts on REDD+, including the preparation of a draft law for the protection of the mangrove forest along the North Atlantic coast of Suriname. Promoting the dual role of adaptation/mitigation, it is looking to promote sedimentation and subsequent mangrove regeneration to increase mangrove forest stock and carbon sequestration.

The **United States** intends to include all categories of emissions by sources and removals by sinks, and all pools and gases (*which would include wetlands*), as reported in the Inventory of United States Greenhouse Gas Emissions and Sinks; to account for the land sector using a net-net approach; and to use a "production approach" to account for harvested wood products consistent with IPCC guidance.

Asia

Bangladesh list the "continuation of coastal mangrove plantation"ⁱⁱ as part of their LULUCF Mitigation actions. However, it is important to note that in this commitment they do not specify how the plantation will be constructed.

The Philippines recognize that marine ecosystems can play a crucial role, including through blue carbon, as joint mitigation and adaption efforts. Some of these ecosystem contributions are articulated in the Philippine

ii Mangrove ecologists warn that just planting mangroves will not mimic a natural forest without additional interventions. So while plantations will increase sequestration they may be detrimental to the natural ecosystem around the mangrove plantation.

National REDD Plus Strategy and the recently updated Philippine Biodiversity Strategy and Action Plan.

Sri Lanka is increasing their forest cover, including the conservation and management of mangrove and wetland ecosystems.
Oceania

Australia intends to apply the IPCC 2006 Guidelines and IPCC 2013 Revised Supplementary Methods, which include coastal wetlands to lower CO₂ emissions by 26 to 28 per cent below 2005 levels by 2030.

Europe

Iceland includes wetland restoration as part of its climate change efforts, and possibly other LULUCF activities, but whether this includes coastal wetlands is unknown and would need further analysis of national activities.²⁷

Coastal wetlands as part of general mitigation aims

In the broader context of “protection of carbon sinks,” 15 countries mention wetlands as an opportunity to enhance carbon sequestration and/or protect carbon sinks. It’s important to note the term “wetlands” does not necessarily specify the inclusion of mangroves, seagrasses and saltmarshes. For further information, the IPCC has provided guidance on the definition of coastal wetlands (see Box 1).

Further, many countries use the term “ecosystem” or refer to “nature-based solutions” in general, often without further specification. Below are countries highlighting the “protection of (wetlands or marine ecosystems) as carbon sinks” and if available, specific details of blue carbon wetlands are provided.

Africa

The Comoros committed to use protected areas to support climate change mitigation, including in the marine environment.

The Seychelles, while not including the offsetting capacity of ocean biomass and marine ecosystems (or blue carbon) in their

mitigation assessment and calculation, the Seychelles acknowledge blue carbon and leave ample room for enhancing their efforts and ambition in their next NDC.

Americas

Antigua and Barbuda under their conditional mitigation targets committed by 2030, all remaining wetlands and watershed areas with carbon sequestration potential are protected as carbon sinks.

Belize will protect existing mangroves from deforestation and restore lost mangroves. The restoration and protection will avoid current emissions of around 11.2Gg CO₂ per year and remove additional 2.2 – 35Gg CO₂ per year between 2020 and 2030. The expected cumulative emissions reduction would be up to 379Gg CO₂ between 2015 and 2030.

In Ecuador, ecosystem and forest protection as well as the strengthening of the national protected areas systems are seen to play a crucial role for the combat of climate change. (Note: The INDC is not clear if these activities are primarily for adaptation or mitigation action.)

Mexico describes the need to increase carbon capture and strengthen coastal protection through conservation and recovery of coastal and marine ecosystems, such as coral reefs, mangroves, seagrass and dunes in its Ecosystem-Based Adaptation section.

Asia

Bahrain identifies a Mangrove Transplantation Project to rehabilitate degraded coastal areas by cultivating and planting mangrove seedlings, which began in 2013, as an adaptation action with mitigation co-benefits. Bahrain recognises the need for proper management of particular habitats that act as critical natural carbon sinks, and notes that seagrass beds, which constitute an important carbon sink, are distributed along Bahrain’s southeast and west coasts and specifically describes them with the term “blue carbon”.

China aims to increase carbon sinks and sequestration in natural environments, including through the stronger protection and restoration of wetlands, but whether this includes coastal wetlands is unknown and would need further analysis of national activities.

The United Arab Emirates dedicates a section of its NDC to “Wetlands, Coastal and Marine Environment Conservation (Blue Carbon).” The UAE is also undergoing significant restoration and plantation efforts of both mangroves and seagrass, supporting ecosystem-based adaptation as well as climate mitigation. The Abu Dhabi Blue Carbon Demonstration Project, which quantified, mapped and identified policy applications for blue carbon in the Emir of Abu Dhabi, has been expanded to a National Blue Carbon Project.

Oceania

The Cook Islands include actions in coastal protection, forestry and marine conservation as those which will reduce and offset carbon emissions as well as strengthen resilience.

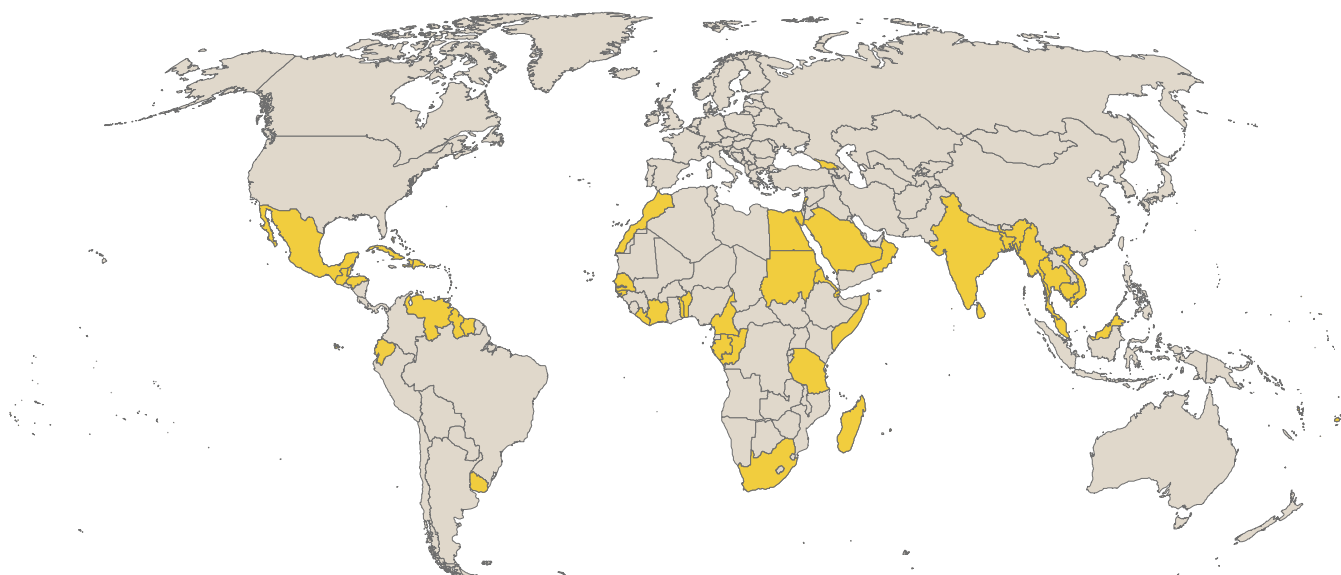
Kiribati is looking at mangrove forest enhancement with a mitigation potential of 7,080 tCO₂e in 2025.

Marshall Islands considers mangrove rehabilitation to be an adaptation action with mitigation co-benefits, including enhancing carbon sinks.

Saudi Arabia identifies increasing sinks for blue carbon as an adaptation action with significant mitigation co-benefits, and highlights implementation of coastal management strategies as a measure through which this can be achieved.



ADAPTATION



Bahamas Bahrain Bangladesh Belize Benin Cambodia Cameroon Cape Verde Cook Islands
Côte d'Ivoire Cuba Djibouti Dominican Republic Ecuador Egypt Eritrea Fiji Gabon Gambia Georgia
Grenada Guatemala Guinea-Bissau Guyana Haiti Honduras India Lebanon Liberia Madagascar
Malaysia Marshall Islands Mauritius Mexico Morocco Myanmar Nauru Niue Oman
Republic of Congo Saint Lucia Saint Vincent and the Grenadines Saudi Arabia Senegal Seychelles
Singapore Somalia South Africa Sri Lanka Sudan Suriname Tanzania Thailand Togo Uruguay
Vanuatu Venezuela Vietnam

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BOX 3: Ecosystem-based Adaptation

Ecosystem-based adaptation (EbA), which integrates the use of biodiversity and ecosystem services into an overall adaptation strategy, can be cost-effective and generate social, economic, and cultural co-benefits and contribute to the conservation of biodiversity.

Ecosystem-based adaptation includes the sustainable management, conservation and restoration of ecosystems to provide services that help people adapt to the adverse effects of climate change. Examples include enhancing coastal defence and reducing coastal flooding and erosion through the maintenance and/or restoration of mangroves.

Source: Convention on Biological Diversity

3.2 Climate adaptation

The NDCs were originally intended to address Parties' actions for achieving the mitigation objective of the Convention as set out in its Article 2 – the stabilization of GHG concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. In 2014 during the COP20 in Lima, Peru one of the decisions detailed that Parties can also “consider communicating their undertakings in adaptation planning or consider including an adaptation component”.²⁸

This section emphasizes that the many countries already engaged in the management of their coastal ecosystems and zones for climate adaptation have an opportunity to include relevant activities in their blue carbon ecosystems into their mitigation ambitions, if relevant and as appropriate (see for recommendations in chapter 5). The paper reflects on those countries which support specific efforts in the coastal zone. Some countries speak in broader terms about biodiversity or ecosystems. Those references are not reflected here.

To date 53 countries have included the conservation and restoration of coastal ecosystems as an adaptation strategy. Some refer to ecosystem-based adaptation (EbA) (see Box 3) in coastal areas, other talk more specifically about restoration or rehabilitation efforts in mangroves or seagrasses. While blue carbon ecosystems are featured explicitly (especially mangroves) in some countries' adaptation portfolios and priorities, the type and form of application varies. In the NDCs, countries mainly refer to coastal ecosystems or the coastal zones as a whole. Although, 22 countries make reference more specifically to planning or zoning related efforts such as coastal zone management.

Conserved and restored coastal blue carbon ecosystems also play an important role for sustainable fisheries management. While the NDCs are not very clear how blue carbon ecosystems are used for adaptation solutions in the fisheries sector, the paper

nevertheless lists those 17 countries highlighting the fisheries sector as a priority adaptation sector as there could be co-mitigation benefits.

Some countries are listed in this adaptation chapter in more than one category if they have, for example, provided extensive details on their adaptation measures and plans in their NDC.

Coastal wetlands as part of conservation, protection and restoration efforts

Several countries recognize in general terms the value of coastal and marine ecosystems, or wetlands, without identifying a particular coastal ecosystem, or providing specific examples or plans of how to manage these systems for climate change adaptation. Other countries provide more specific information regarding on-going plans around conservation and management, protection, and reforestation or rehabilitation measures of coastal ecosystems.

Such countries include Bahamas, Bahrain, Bangladesh, Belize, Benin, Cameroon, Cape Verde, the Republic of Congo, Cook Islands, Cote d'Ivoire, Cuba, Djibouti, Dominican Republic, Ecuador, Egypt, Fiji, Gabon, Gambia, Grenada, Guinea-Bissau, Guyana, Haiti, Honduras, India, Lebanon, Liberia, Madagascar, Marshall Islands, Mauritius, Mexico, Morocco, Myanmar, Nauru, Niue, Oman, Philippines, Saint Lucia, Saint Vincent and the Grenadines, Saudi Arabia, Senegal, Seychelles, Singapore, Somalia, South Africa, Sri Lanka, Sudan, Suriname, Tanzania, Thailand, Togo, Uruguay, Venezuela and Vietnam.

Country Highlights (see Appendix for all countries):

Africa

Cape Verde seeks to promote its “ocean-based (‘blue’) economy” and to “rehabilitate or construct infrastructures for the protection of coastal zones against sea level rise” as well as “protecting and preventing degradation of coastal zones and their habitat” for climate change adaptation.

Asia

Vietnam's actions include the protection, restoration, planting and improvement of the quality of coastal forests, including mangroves, especially in coastal estuaries and the Mekong and Red River deltas. Plans include increasing forest coverage to 45%, with forest protection in coastal areas increasing to 380,000ha, including 20-50,000ha of additional mangrove planting.

Americas

Uruguay's main adaptation actions are the "restoration and maintenance of coastal ecosystems services" and the "development of a National Adaptation Plan for the coastal sector."

Coastal zone management for climate adaptation

Several countries are undertaking and/or see the need to prioritize adaptation in their coastal zones management. A specific program listed in several NDCs is (Integrated) Coastal Zone Management (CZM), a process for the management of the coast that considers all aspects of the coastal zone, including geographical and political boundaries, to achieve sustainability. In several NDCs, countries have referenced CZM or similar processes in relation to land-use planning, creation of ecological buffer zones, and establishing protected inland zones to accommodate coastal wetlands.

Such countries include Bangladesh, Belize, Cambodia, Cameroon, Egypt, Eritrea, Gabon, Gambia, Georgia, Grenada, Guatemala, Haiti, Liberia, Malaysia, Morocco, Myanmar, Niue, Saint Lucia, Saudi Arabia, Sudan and Vanuatu.

Country Highlights (see Appendix for all countries):

Africa

Morocco identifies protection of populations through risk-prevention, particularly in the most vulnerable areas such as coastal zones, as an ultimate objective, and plans to implement this through the National Strategy for Integrated Coastal Management, amongst others.

Egypt recognizes that adaptation options for coastal zones are highly site-dependent. However, changes in land use, integrated coastal zone management, and proactive planning for protecting coastal zones are necessary adaptation policies.

Asia

Bangladesh outlines community based conservation of wetlands and coastal areas as an adaptation measure, and intends to work on Coastal Zone Management.

India has demarcated vulnerable areas on the coasts and declared them as Coastal Regulation Zones (CRZ) with restrictions imposed on setting up and expansion of industries, operations and processes. India is also implementing programmes including Integrated Coastal Zone Management (ICZM); protecting coastal livelihoods through 'Mangroves for the Future' (coordinated by IUCN); an Island Protection Zone (IPZ) which focuses on disaster risk reduction through bio shields with local vegetation (mangroves) and other soft protection measures; and the conservation of beaches and sand dunes.

Americas

Belize recognises the adaptation value of coastal wetlands, with pledges to restore and protect those systems using integrated coastal zone management as an adaptation measure.

Adaptation in the fisheries sector

Some countries see the need to prioritize adaptation in job-generating sectors using coastal and marine resources, including fisheries and forestry. While coastal wetlands ecosystems are not necessarily mentioned specifically, many of those activities are likely to happen in, touch on or be adjacent to blue carbon ecosystems.

These countries include Bahamas, Belize, Brunei, Cambodia, Cameroon, Cape Verde, Costa Rica, Djibouti, Haiti, Jamaica, Mauritius, Nigeria, Oman, Saint Lucia, Sierra Leone and Tanzania.

Country Highlights (see Appendix for all countries):

Africa

Cape Verde seeks to promote an ocean-based (“blue”) economy by, among others, supporting new techniques of aquaculture, improving quality of fishery products through ecolabelling, and promoting sustainable coastal and maritime tourism and sports.

Mauritius is looking into climate smart fisheries through the development and implementation of sustainable fishing management plans, the strengthening of institutional capacity and adaptation of infrastructure to climate change .

Asia

Oman wants to address adaption needs in the fisheries and marine environment.

Americas

For **Haiti** sustainable fisheries management is a priority adaptation sector.

3.3 Mitigation and adaptation. Coastal wetlands to create synergies

While tropical forests and other forest types, besides mangroves, tend to be highly “valued” in terms of their mitigation potential, coastal ecosystems have been more widely recognised for adaptation– see above section.

The synergies, or co-benefits, between mitigation and adaptation using nature-based solutions have become increasingly clear. This is represented at different levels throughout the NDCs. For coastal systems, these synergies have overlapping benefits. This is particularly relevant for countries that are already including the value of coastal ecosystem zone management for adaptation. If habitats are being restored for adaptation there is associated natural carbon removal, and thus direct mitigation benefits. In recognition of this, a few countries include coastal ecosystems as examples of synergies between mitigation and adaptation approaches. For countries that only consider adaptation benefits of coastal habitats, there is an opportunity to include relevant activities in their coastal (blue) carbon ecosystems (mangroves, saltmarshes and seagrasses) in their mitigation ambitions, if relevant and as appropriate (see for recommendations in chapter 5). Countries that have identified blue carbon ecosystems as adaptation opportunities with mitigation co-benefits include:

Such countries that have acknowledged coastal synergies include: Antigua and Barbuda, Bahrain, Belize, Cook Islands, Madagascar, Marshall Islands, Mexico, Philippines, St Lucia, Saudi Arabia, Suriname and Togo.





4 Beyond NDCs. Other blue carbon efforts around the world

Some UNFCCC Parties with large blue carbon ecosystems have not specifically mentioned related ongoing or planned mitigation and/or adaptation efforts in their NDC. However, this does not mean that these countries are not pursuing nature-based solutions for coastal mitigation and/or adaptation. Countries might have chosen deliberately to broadly talk about “ecosystems” and not call out specific ones. Or it could reflect that these countries have not put an emphasis on blue carbon efforts. In many cases, these countries have used blue carbon ecosystems within other climate reporting and planning mechanisms such as National Adaptation Plans (NAPs), or National Adaptation Plans of Actions (NAPAs), or are trying to develop National Appropriate Mitigation Actions (NAMAs) on Blue Carbon, for example the Dominican Republic.

Work done by several stakeholders on the national, sub-national or local level shows activities, both in terms of policy development and implementation, are well underwayⁱⁱⁱ.

The list below is simply to highlight those Parties that have made official commitments to coastal wetlands in terms of mitigation using other mechanisms besides NDCs. Countries include: *Barbados, Brazil, Chile, Canada, Columbia, Dominican Republic, Ghana, Iran, Japan, Kenya, Mozambique, New Zealand, Nigeria, Oman, Pakistan, Papua New Guinea, Panama, Qatar, Samoa, Tuvalu, Trinidad and Tobago, Yemen.*



BOX 4: INTERNATIONAL PARTNERSHIP FOR BLUE CARBON

Australia announced at UNFCCC COP21 the creation of a new, country-driven partnership to generate and support further commitments and coordination to advance blue carbon policy and projects around the world. The founding members include Australia, Indonesia, and Costa Rica, as well as multiple intergovernmental and nongovernmental organizations.

The Partnership aims to mitigate climate change through coastal wetland ecosystems. It will collaborate to amplify blue carbon efforts through a network of resources and support, including data and research, capacity building, and mobilization of funding. Under the umbrella of Sustainable Development Goal (SDG) 14, the partnership has committed to:

- Reversing the current trend of the degradation of marine and coastal habitats and maintain the amount of carbon sequestration
- Significantly increasing the area of blue carbon ecosystems under effective ecosystem-based management.

ⁱⁱⁱ To read about more carbon related projects see: [UNEP/GEF Blue Forests Project](#) and the [Blue Carbon Initiative](#)

TABLE 2. A SCHEMATIC OVERVIEW OF HOW TO ADDRESS, AND SCALE UP THE MITIGATION CONTRIBUTION OF COASTAL BLUE CARBON EFFORTS, WHILE ALIGNING WITH EXISTING OR PLANNED ADAPTATION EFFORTS FOR FUTURE NDCs.

NDC <i>List of potential actions for enhanced ambition of future submissions</i>	Mitigation <i>mangroves, seagrasses and saltmarshes</i>	Adaptation <i>mangroves, seagrasses and saltmarshes, and other coastal and marine ecosystems</i>
1. Basic mitigation and adaptation information		
1.1 Scope and coverage	Detail inclusion of mangroves, seagrasses and saltmarshes as mitigation solutions	Detail inclusion of mangroves, seagrasses and saltmarshes as adaptation solutions along with relevant other coastal systems (e.g. coral reefs, bivalves) and coastal and marine resource activities (e.g. fisheries) as adaptation solutions
1.2 Methodological processes	National GHG Inventory: Detail the use of IPCC Wetlands Supplement LULUCF: Detail whether wetlands are included, and if so, how coastal wetlands are included.	
2. Examples of programmatic opportunities for coastal nature-based mitigation and adaptation		
2.1 Outline relevant policies and plans, or reforms needed	-National Climate Change Plans	
	-National GHG Mitigation Plans -REDD+ (mangroves only) -NAMAs -Use of market mechanisms that are aligned with decisions and modalities of the UNFCCC	-NAPs/ NAPAs
2.2 Outline the national legal and regulatory context for blue carbon ecosystems	-Environmental Law -Coastal Management Law -Fisheries Law	
2.3 Detail steps on efforts towards a more synergistic and programmatic approach for coastal areas	-Integrated Coastal Zone Management (ICZM) -Detailed mangrove management plan which include the appropriate linkages of relevant mitigation (e.g. REDD+, NAMA) and adaptation (NAP/NAPAs) activities, laws and other plans, e.g. National Biodiversity Plans or other; -Recognizing the synergies and co-benefits of coastal blue carbon management for both mitigation and adaptation of climate change	
2.3 Outline relevant opportunities and pilot case studies that can help promote the integration of blue carbon into NDCs	-With clear mitigation (blue carbon) benefits and primary purpose, contributing to GHG emission reductions	-With clear adaptation benefits and primary purpose, with mitigation as a co-benefit
2.4 Outline Funding	-Identify funding opportunities and means to fast-track effective implementation while upholding environmental integrity	

5 Where next with blue carbon within the NDC process

Our analysis shows that only 19% of Parties with coastal wetlands ecosystems have included coastal wetlands specifically in their NDC for mitigation. In adaptation it is 39% of Parties with coastal wetlands ecosystems. Enhancing ambition by ending conversion and restoring coastal wetlands to their 1990 distributions could reduce emissions by 0.6 GtCO₂e.

Using the growing knowledge of various policy applications, from project findings and sources of finance for blue carbon activities, Parties now have an opportunity to include such actions into their revised, and more ambitious, future NDCs (see Table 2).

Mangroves, saltmarshes and seagrasses not only play a significant role for coastal EbA, but if managed properly, contribute to climate change mitigation. Conversely, if mismanaged or destroyed, they contribute to increased GHG emissions. To date, coastal wetlands are typically featured or referred to very visibly and clearly in an adaptation context, including in the existing NDCs. It is often less clear whether any of the three systems (mangroves, saltmarshes, and seagrasses) are included in mitigation efforts.

Going forward, a more **nuanced and refined approach** for addressing, and reflecting their dual value for mitigation and adaptation should be considered, where appropriate. There is no one-strategy-fits-all available, as these three systems operate between definitions and categories construed by the UNFCCC. Acknowledging the variety of synergistic mitigation and adaptation blue carbon opportunities for countries' is important when considering future revised commitments.

This overview also shows that a more **synergistic and programmatic approach** for addressing nature-based mitigation and adaptation efforts is particularly beneficial

in coastal zones. While single projects can lead to much bigger programmatic efforts, and are useful to pilot ideas, future NDCs would benefit from outlining coastal adaptation and mitigation efforts in the broader policy contexts of, for example, coastal zone management or, in the case of mangroves, including efforts within national REDD+ strategies. This has also already been pointed out by Laurans et al. 2016.²⁹

Mitigation NDC Opportunities

National GHG inventories: One of the most significant opportunities is for countries to include coastal wetlands in national carbon inventories. Guidance in the IPCC 2013 Wetlands Supplement details how to account for these systems including default values for emissions and removals. Efforts are underway in several countries and will provide feedback on the Supplement in 2017³⁰. In future NDCs and national GHG inventory submissions, Parties could highlight whether coastal wetlands, as part of the IPCC Wetlands Supplement, are part of their inventories.

Mangroves in forest mechanisms:

Mangrove conservation and restoration efforts are already incorporated in UNFCCC forest mechanisms such as REDD+ and as part of LULUCF activities if a country defines mangroves as a forest. If soils are a significant source or sink as defined using IPCC key category analysis, like in mangrove forests, soil carbon will be included in REDD+ or LULUCF. As Parties review opportunities for the revised NDC, there is an opportunity to highlight mangroves in this context.

NAMAs: NAMAs (Nationally Appropriate Mitigation Actions) are opportunities for developing countries to conduct climate mitigation projects that also have a focus on social benefits. NAMAs include blue carbon efforts in land-use change, conservation and restoration activities in coastal ecosystems.

Given the multiple social benefits provided by coastal wetlands, these ecosystems are well positioned to be included. Parties that embark on developing a NAMA with blue carbon elements could use the opportunity during the consideration of a revised NDC to reference these efforts.

considered by many Parties within their NAPs/NAPAs. In future NDCs, Parties could use the opportunity to highlight how their NAPs/NAPAs are already, or will manage coastal ecosystems for climate adaptation.

Adaptation NDC Opportunities.

NAPs/NAPAs: Nationally Adaptation Programs for Action (NAPAs) provide a process to respond to urgent and immediate needs of Least Developed Countries (LDCs) to adapt to climate change. National Adaptation Plans (NAPs) enable Parties to identify medium- and long-term adaptation needs and develop and implement strategies and programmes to address those needs. Coastal wetlands are already



6 A refined look for blue carbon efforts in future NDCs. A conclusion

This review of the existing NDCs has shown that coastal ecosystems, and the use of nature-based solutions, already figure into Parties' submitted climate change ambitions, particularly with regards to addressing climate adaptation. Looking ahead, there are significant opportunities highlighted in this report that exist for further inclusion of coastal carbon ecosystems (mangroves, saltmarshes and seagrasses) into NDCs. As countries increase their ambition in future commitments, a bigger effort should be made to promote the integration of coastal carbon systems as part of (1) mitigation ambitions and (2) in a synergistic and programmatic coastal management approach with adaptation and mitigation considerations.

To date, coastal carbon systems have not been uniformly integrated into climate change plans, especially within mitigation actions, as demonstrated in this analysis. In general, the three blue carbon systems – mangroves, seagrasses, and saltmarshes – exist in the UNFCCC mitigation context within multiple definitions and categories, and related climate actions are implemented differently per country. Given the lack of a common definition of blue carbon mitigation activities it is not always easy to decipher when its included in the NDC. In this regard, more work is needed to clearly articulate work on coastal carbon ecosystems into the NDCs and more broadly.

In several Parties' NDC adaptation sections, blue carbon ecosystems are referred to as carbon sinks or noted for their high carbon sequestration ability. This, combined with the multiple references to the recognition of adaptation and mitigation synergies in nature-based solutions to climate change, show the dual importance of coastal ecosystems for addressing climate change but also the combination of adaptation and mitigation objectives. In many of the NDCs, it is difficult to know if countries that list blue

carbon activities within their adaptation sections are also including those mitigation gains into their national GHG inventories. An important opportunity exists to ensure the co-benefits of blue carbon ecosystems for mitigation and adaptation are accounted for in both sections of NDCs, where appropriate.

This report provides a tool and guidance for relevant countries to strengthen their NDCs with nature-based solutions through the protection of coastal wetlands.



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