Coastal blue carbon:

AN INTRODUCTION FOR POLICY MAKERS

INTERNATIONAL PARTNERSHIP FOR
BLUE CARBON

Preface

Coastal blue carbon: an introduction for policy makers provides an introduction to the concept of blue carbon and coastal blue carbon ecosystems – mangroves, tidal marshes and seagrasses. It outlines:

- why blue carbon ecosystems are important
- the basic science of blue carbon as a basis for policy and practical action
- an overview of relevant policy frameworks, and
- a summary of finance sources that can support practical action.

The document describes some of the challenges and opportunities in developing policies and undertaking projects to protect and restore coastal blue carbon ecosystems. It also highlights some of the projects and countries that are leading the way in managing these challenges and opportunities.

It is hoped this will serve as a reference for those who are new to blue carbon and those who are seeking to bring a greater focus on blue carbon in their jurisdictions.

This document has been prepared by the International Partnership for Blue Carbon.

The International Partnership for Blue Carbon (the Partnership), announced by Australia at the Paris climate change conference in 2015, is a voluntary partnership bringing together governments, non-government organisations and research institutions. Its partners seek to protect and restore coastal ecosystems in recognition of their value for climate change mitigation and adaptation, and other ecosystem services.

The University of Queensland and the Australian Government Department of the Environment and Energy led the development of this information product with valuable contributions from other members of the Partnership.

More information on the Partnership can be found at **BlueCarbonPartnership.org**

What are coastal blue carbon ecosystems?

The term ‘coastal blue carbon ecosystems’ refers to three main types of vegetated coastal habitats – mangroves, tidal marshes, and seagrasses – and their part in the global carbon cycle[1].

These ecosystems sequester carbon dioxide from the atmosphere, and store it in the stems, branches, leaves and roots of plants. Large amounts of carbon are also stored in the rich organic soils. Coastal blue carbon ecosystems provide numerous other benefits and services, including protection from storms and sea level rise, prevention of shoreline erosion, and regulation of water quality. They are a habitat for commercially important fisheries and endangered marine species, and provide food security for many coastal communities.

Mangroves

Mangroves are evergreen shrub lands or forests that occur in tropical and subtropical shores and estuaries. They generally grow from mean sea level to the highest spring tide. Countries with the largest areas of mangroves include Australia, Bangladesh, Brazil, Cuba, India, Indonesia, Malaysia, Mexico, Mozambique, Myanmar, Nigeria and Papua New Guinea.

Tidal marshes

Tidal marshes are dominated by dense salt-tolerant plants such as succulent herbs and low shrubs, and grasses. They are found on soft sediments on sheltered coastlines, from the sub-arctic to the tropics, though most extensively in the temperate zones of Europe, North America, and Australia and in the higher latitudes of South-America and Africa[2].

Seagrasses

Seagrasses are communities of underwater-flowering plants. They are generally restricted to habitats with sediments comprised of sand, silt and mud and high light availability. Seagrasses prefer wave-sheltered conditions and are found in coastal waters of all continents except Antarctica.

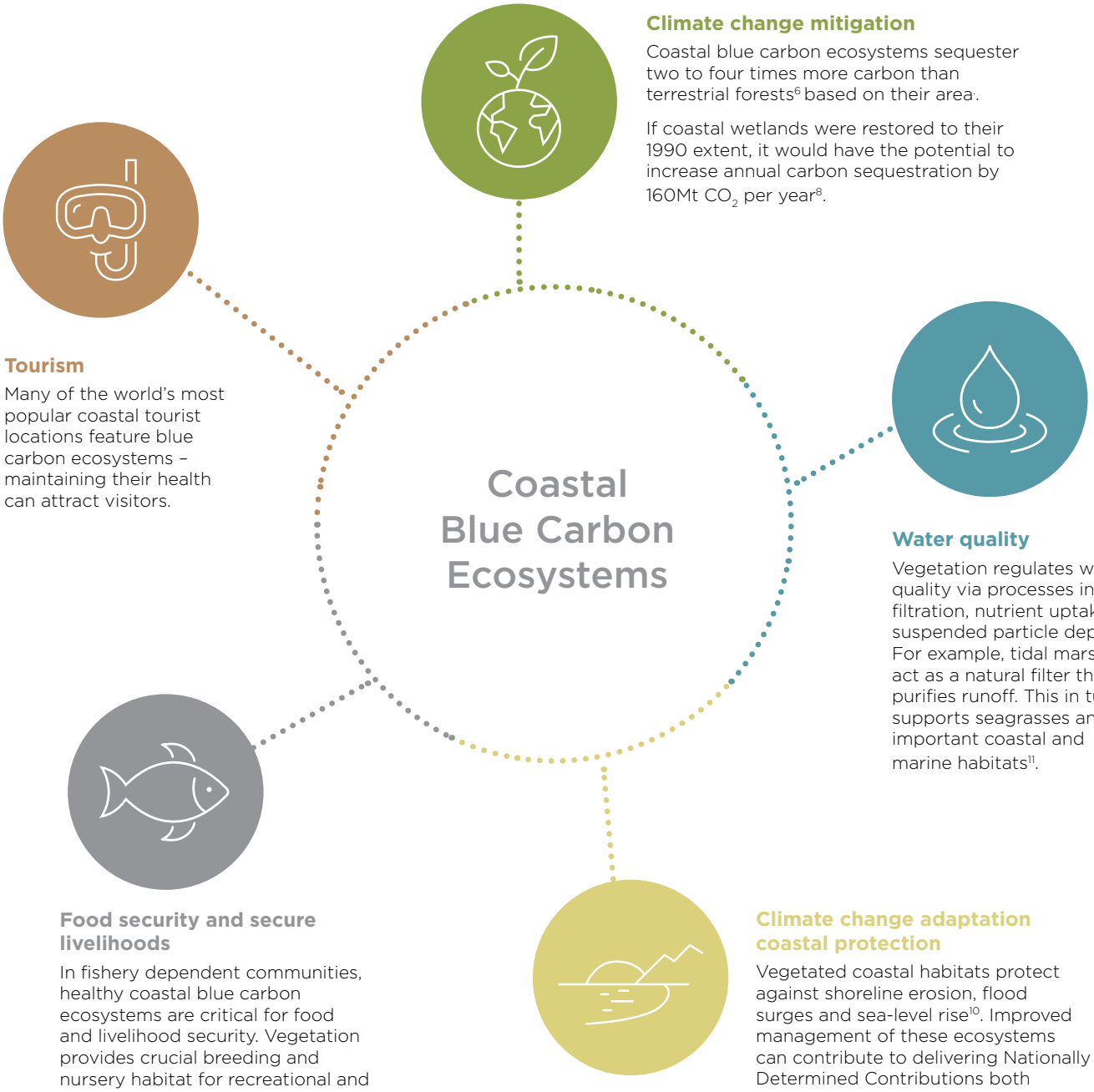
Despite their importance, coastal blue carbon ecosystems are some of the most threatened ecosystems on Earth. An estimated 340,000 to 980,000 hectares are being destroyed each year[3]. Up to 50 per cent of mangroves over the past 50 years, and 50 per cent of tidal marshes and 30 per cent of seagrass meadows are estimated to have been lost globally[4].

In many countries, coastal blue carbon ecosystems are increasingly recognised as important economic and environmental assets. There is growing awareness of the significant climate change mitigation and adaptation opportunities provided by their ecosystem services, such as carbon sequestration and coastline protection. A testament to this growing understanding are the many countries that have included measures related to coastal blue carbon ecosystems in their commitments under the Paris Agreement.

Why are blue carbon ecosystems important?

Coastal blue carbon ecosystems are found along the coasts of every continent except Antarctica. Combined, these ecosystems cover an approximated global extent of 49 million hectares[5].

Coastal blue carbon ecosystems are amongst the most valuable ecosystems globally based on their multiple benefits.



Climate change mitigation

Coastal blue carbon ecosystems sequester two to four times more carbon than terrestrial forests[6] based on their area.

If coastal wetlands were restored to their 1990 extent, it would have the potential to increase annual carbon sequestration by 160Mt CO_2 per year[8].

Tourism

Many of the world's most popular coastal tourist locations feature blue carbon ecosystems – maintaining their health can attract visitors.

Water quality

Vegetation regulates water quality via processes including filtration, nutrient uptake and suspended particle deposition. For example, tidal marshes act as a natural filter that purifies runoff. This in turn supports seagrasses and other important coastal and marine habitats[11].

Food security and secure livelihoods

In fishery dependent communities, healthy coastal blue carbon ecosystems are critical for food and livelihood security. Vegetation provides crucial breeding and nursery habitat for recreational and commercial fisheries species such as scallops, shrimp, crabs, and fish[7].

Climate change adaptation coastal protection

Vegetated coastal habitats protect against shoreline erosion, flood surges and sea-level rise[10]. Improved management of these ecosystems can contribute to delivering Nationally Determined Contributions both through carbon sequestration and storage, and adaption.

CASE STUDY

Blue carbon demonstration project in Abu Dhabi

The value of coastal blue carbon ecosystems in Abu Dhabi was recognised through a one-year exploratory research project in 2012, which also led to their incorporation in national policies and international commitments.

The project undertook a carbon baseline assessment and mapped the extent of ecosystems in the country. Abu Dhabi's coastal blue carbon ecosystems are estimated to store more than 41 million tonnes of CO_2 – more than the emirate's annual emissions from the oil and gas sector (26.4 million tonnes)[12]. The project also estimated the value of all ecosystem services – carbon, coastline protection, and habitat and water purification – to be in excess of USD500 million.

Project findings have been recognised in policies and management strategies, including biodiversity strategies, local planning and climate change programmes[12]. Abu Dhabi has included coastal blue carbon ecosystems in the emirate' greenhouse gas inventory which has been communicated to the United Nations Framework Convention on Climate Change. The United Arab Emirates has also highlighted these ecosystems in its Nationally Determined Contribution under the Paris Agreement.

Partners

This project was led by Abu Dhabi Global Environmental Data Initiative (AGEDI) and supported by an expert team led by GRID-Arendal, including United Nations Environment Programme (UNEP), UNEP-World Conservation Monitoring Centre (UNEP-WCMC) and Forest Trends.

Science and research

Coastal blue carbon ecosystems sequester two to four times more carbon than terrestrial forests[6] on an area basis, and are increasingly being recognised for their role in mitigating climate change.

Depending on the type of ecosystems and their location, their capacity to sequester and store carbon varies. There is work underway to refine estimates of carbon stocks, sequestration and carbon change regionally and nationally and to build on and refine the methods available to assess carbon stocks.

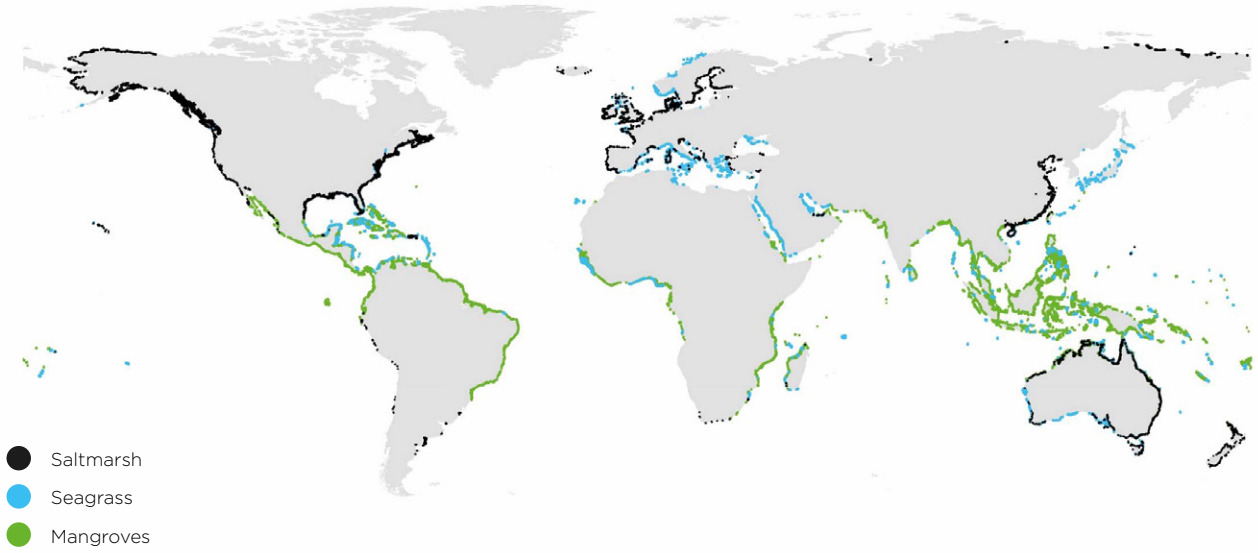
When degraded or lost, these ecosystems can become significant emissions sources – mangrove deforestation is estimated to be as much as 10 per cent of emissions from deforestation globally[9].

The main causes of destruction and degradation vary, but human activities have significant influence. Some examples of the drivers of change to coastal environments are land reclamation or changes in coastal use (i.e. aquaculture and recreational activities), hydrological modifications, dredging, eutrophication, and pollution. Indirect influences include rising sea levels, coastal inundation, erosion, changing sea temperatures, and severe or abnormal weather events.

Global distribution of blue carbon

There are four main dimensions of coastal blue carbon ecosystems that can be mapped - extent, carbon stocks, rate of carbon accumulation and loss, and species composition. The amount and quality of spatial data available varies for each of these dimensions and each blue carbon ecosystem. Data about the extent of coastal blue carbon ecosystems is currently the most comprehensive.

The United Nations Environment – World Conservation Monitoring Centre (UNEP-WCMC[13]) datasets have been used to present an overview of the global distribution of mangroves, saltmarshes and seagrasses.



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 .Data URL: data.unepwcmc.org/datasets/4

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The total global area of mangroves has been estimated as 8.2 million hectares[14]. Tidal salt marshes have been conservatively estimated to cover an area of 5.495 million hectares[15]. The global area of seagrasses is less well defined.

Rates of change of mangrove ecosystems have been assessed more frequently than tidal marshes and seagrasses. The global mangrove deforestation pattern from 2000 to 2012 is one of decreasing deforestation, with deforestation rates between 0.16 per cent and 0.39 per cent per year, and many nations essentially stable; the exception being Southeast Asia. The loss of tidal marshes has been documented on country or regional scales, with no synthesised or global-level studies on the rate of change of tidal marshes published to date. A global seagrass assessment reported that 29 per cent of the known areas of seagrasses have been lost since they were initially recorded in 1879. Further information concerning rates of change in these ecosystems will support refined carbon estimations for inclusion in national greenhouse gas inventories and inform future projects.

Stocks and change

Spatially accurate information is required to inform fulsome accounting of carbon stocks and to track rates of change. Best practice carbon accounting uses spatially explicit carbon stock and change data to estimate the impact of changed management practices on carbon stocks in an area. Work is progressing to develop more spatially explicit estimates, or 'mapping', using bioregions or detailed maps of blue carbon communities derived from vegetation mapping or modelling, and extensive field data sets.

Ongoing research and analysis, including initial carbon accounting at the country and regional level is providing greater insight into the rate of change in coastal blue carbon ecosystem areas, and the drivers of change. A number of relevant blue carbon tools and methods are available to quantify the carbon sequestration and storage potential of blue carbon projects – see 'Further information and resources' at the end of this document. As our understanding of coastal blue carbon ecosystems continues to grow, relevant tools and information will also be refined and become more accessible.

CASE STUDY

Research towards tailored national blue carbon strategies in the Coral Triangle

This project will investigate the extent, carbon storage, and dynamics of coastal blue carbon ecosystems in Indonesia and the Philippines. This will inform the development of a model that allows the estimation of changes in carbon in response to various activities. The project will run from 2017-2022 and will also assess blue carbon ecosystem services.

The findings of this project will assist in the development of a blue carbon strategy for each country for local and national adoption. These strategies are expected to include a citizen science program, which brings together local government, non-government organisations (NGOs), students, and the wider community to contribute to local climate change mitigation and adaptation with guidance from the project's scientists.

Partners

'BlueCARES' project - funded by Japan International Cooperation Agency and Japan Science and Technology Agency, involving Japan's Science and Technology Research Partnership for Sustainable Development, University of the Philippines Diliman, Indonesia Ministry of Marine Affairs and Fisheries and others.

Blue carbon policy landscape

There are a number of existing international and national frameworks (conventions, programs, agreements, protocols, and more) that guide or commit parties to manage, protect, and conserve coastal blue carbon ecosystems.

Many existing policies, strategies, and management approaches that address coastal and marine ecosystems, forests, or vegetation communities, also contribute to protecting coastal blue carbon ecosystems. However, the design and implementation of policies which are specifically focused on the climate change mitigation potential of coastal blue carbon ecosystems is still in its infancy.

While coastal blue carbon ecosystems can be managed via multiple frameworks, the drivers and consequently the scale of impact will differ from one commitment to another. For example, national responses to international environmental management frameworks tend to respond to either a biodiversity conservation agenda, or, climate change mitigation and/or adaptation agendas. There are opportunities to design policies or actions so that they address both objectives and achieve greater benefits. Ultimately the policy direction that countries prioritise will depend on their national circumstances, and what it is they wish to achieve. While commitments under international conventions can assist in raising the profile of the abundance of ecosystems in certain countries or contribute to securing finance, locally focused policy approaches such as management strategies or cross-sectoral working groups can be important building blocks.

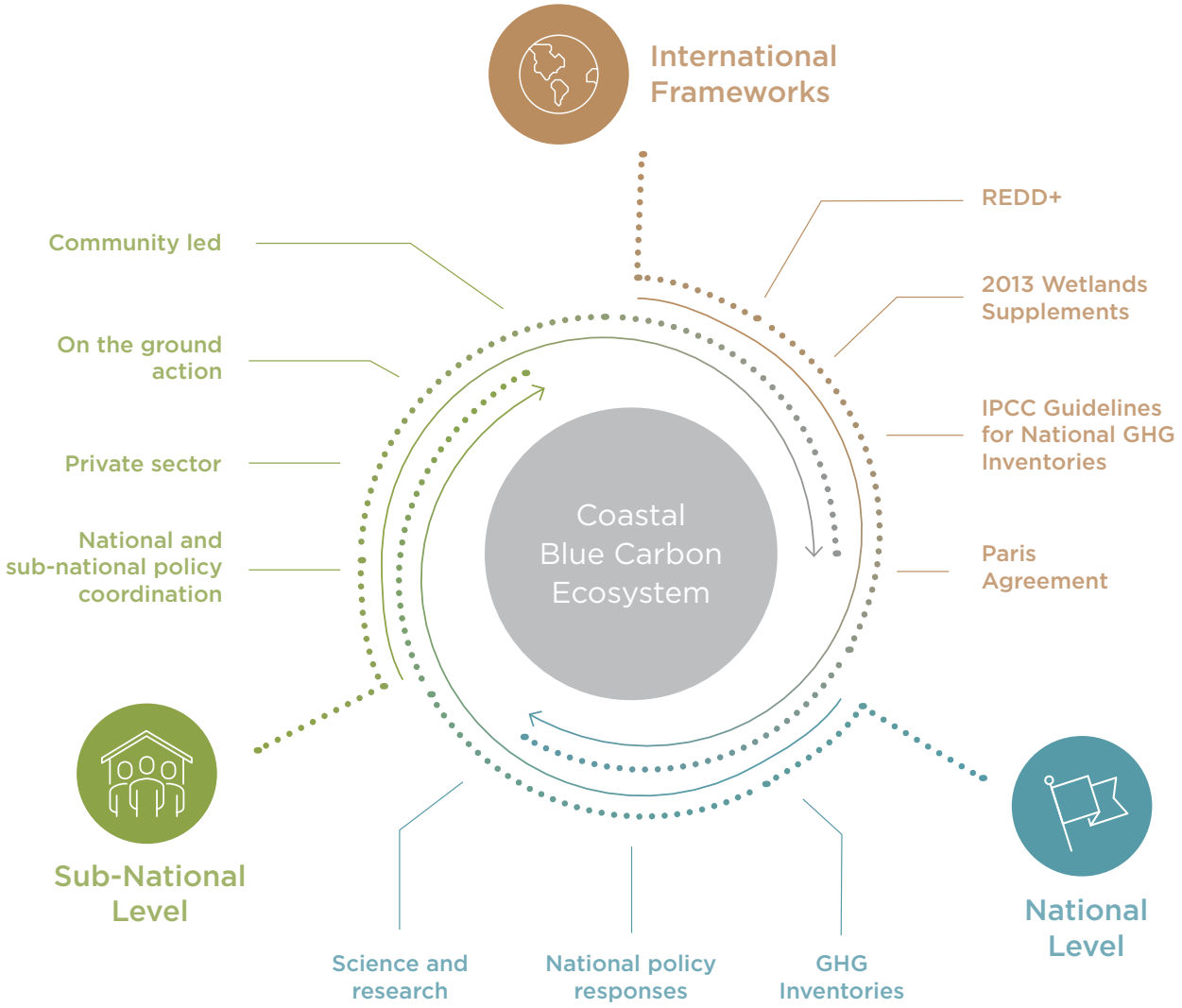
This section provides an overview of the international conventions, frameworks and mechanisms that have contributed to the recognition of coastal blue carbon ecosystems and their important role in global climate action, and laid the foundations for countries to undertake internationally recognised actions.

Climate Change Conventions a historical snapshot

Under the United Nations Framework Convention on Climate Change (UNFCCC), countries have agreed to take action to address climate change, by monitoring and reporting their national emissions, and taking mitigation and adaptation action. In accordance with the UNFCCC and its decisions, countries use guidance for the estimation of emissions and removals developed by the Intergovernmental Panel on Climate Change (IPCC) to produce national inventories of greenhouse gases and removals. Some countries are progressively implementing this guidance to better understand emissions and removals from coastal blue carbon ecosystems. Countries have agreed to take action under the UNFCCC that is broadly inclusive of blue carbon.

The Kyoto Protocol, developed under the UNFCCC to advance its ultimate objective, recognises the role of the land sector in addressing climate change by encouraging Parties, in the context of working to achieve their emissions reduction targets, to implement policies and measures to protect and enhance carbon sinks and reservoirs and promote sustainable forest management practices. Under the UNFCCC's Cancun Agreements, countries made voluntary pledges to reduce or limit emissions by 2020. The pledges of developed country Parties took the form of economy-wide emissions reduction commitments. Developing country Parties established mitigation objectives through Nationally Appropriate Mitigation Actions (NAMAs). Other avenues and funds have generated action by developing countries, including via National Adaptation Programmes of Action (NAPAs).

The Clean Development Mechanism (CDM) is an approach to meeting emission reduction targets under the Kyoto Protocol. It has also encouraged emission reduction projects in developing countries and built capacity in communities to oversee those projects. While the majority of these projects have not been land sector projects, the CDM helped develop frameworks and capacity that could support future carbon projects.



CASE STUDY

Mangrove blue carbon NAMA in the Dominican Republic

The Dominican Republic is taking steps to reduce greenhouse gas emissions by protecting and restoring mangroves, including through a Nationally Appropriate Mitigation Action (NAMA)[16].

The NAMA includes priorities to undertake research to quantify the country's current carbon stocks and potential to increase these stocks, and to work closely with communities and businesses to ensure they assist with and receive the economic benefits of protecting mangrove ecosystems. This will feed into consideration of the potential for mangrove protection and restoration to provide carbon credits.

Lessons learned, including the development of a toolkit, are intended to be shared with other governments and organisations in Latin America and the Caribbean.

Partners

Counterpart International in conjunction with the President's Climate Council

Paris Agreement and Nationally Determined Contributions

The Paris Agreement was a turning point for global cooperation on climate change. Parties have committed to collectively strive to limit the global average temperature increase to well below 2°C above preindustrial levels and pursue efforts to limit the increase to 1.5°C. Parties set their own targets, or Nationally Determined Contributions (NDCs), which should reflect their highest possible ambition for the contribution they can make to global greenhouse gas emissions reductions. The expectation is that commitments would become more ambitious from one period to the next.

The Paris Agreement was also an important moment for raising the profile of the role of coastal blue carbon ecosystems in contributing to global emissions reductions and compelling countries to actively protect them. The UNFCCC (Article 4.1d) had already established coastal and marine ecosystems as important sinks and reservoirs of greenhouse gases (along with forests and other terrestrial ecosystems) and called for Parties to promote their sustainable management and collaborate on their enhancement. Article 5 of the Paris Agreement then directly called on Parties to take action to conserve and enhance coastal and marine ecosystems and all other sinks and reservoirs.

When countries include coastal blue carbon ecosystems in their NDCs and climate change strategies, it sends a strong signal to the rest of the world that these ecosystems are important for climate action – both mitigation and adaptation – and encourages Parties to take steps to continually enhance their protection. Twenty-eight countries have taken this step and listed coastal blue carbon ecosystems in their NDCs. Fifty-nine countries include them in their adaptation strategies[8]. This is a relatively small proportion of the total number of countries that hold coastal blue carbon ecosystems - 151 countries have at least one, and of these, 71 countries contain all three ecosystems. Facilitating more countries to pursue blue carbon in NDCs by providing policy support and hosting technical exchanges could lead to greater action on the ground.

2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories

Among a range of actions by Parties to achieve the objective of the UNFCCC is the commitment to publish national inventories of anthropogenic emissions by sources and removals by sinks of greenhouse gases, including from the land sector. The 2006 IPCC guidelines and earlier volumes include limited methodological guidance relevant to coastal blue carbon ecosystems. However, the '2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands' (the Wetlands Supplement) provides emission factors and methodologies relevant to coastal wetlands that include mangroves, tidal marshes and seagrass. The 2013 Supplement allows Parties to better capture emissions/removals from mangroves, and to expand coverage into tidal marsh and seagrass meadows. Several countries have begun implementing the Wetlands Supplement in their inventory report, including Australia, the US, Japan and Canada.

Inventories assist countries to better understand their blue carbon ecosystems and develop policies accordingly.

REDD+

The Warsaw Framework for REDD+, adopted at UNFCCC Conference of Parties (COP) 19 in 2013 includes reducing emissions from deforestation and forest degradation, conservation and sustainable management of forests, and enhancement of forest carbon stocks. REDD+ provides a framework for countries to improve management of forests, including the measurement, reporting and verification, development of forest monitoring systems, and safeguards (including consideration of social and environmental issues). The Warsaw Framework has led to the establishment of several multilateral bodies that support the implementation of REDD+, including the World Bank's Forest Carbon Partnership Facility among others. Mangroves are included in some countries' definitions of forests and can therefore be accounted for under their REDD+ frameworks. This framework does not include tidal marshes and seagrasses.

CASE STUDY

Blue carbon in Australia's national inventory

Australia is progressively implementing the 2013 IPCC Wetlands Supplement in its national greenhouse gas inventory, and has prioritised coastal blue carbon ecosystems due to their extent and importance in Australia.

Australia's 2015 National Inventory report (released in June 2017) contains national greenhouse gas emission estimates for the period 1990-2015, including changes in mangroves and tidal marshes following the Wetlands Supplement guidance. Subsequent issues of the report will also include emission and removals associated with capital dredging activities affecting seagrasses.

The development of regionally-specific parameters and emission values for Australia is well supported by extensive scientific literature based on earlier research programs on coastal wetlands. The inventory was also developed with the assistance of an expert advisory group.

CASE STUDY

The value of mangroves in the Solomon Islands

Eighty-five per cent of people in the Solomon Islands live in rural communities and are heavily dependent on land and sea resources for food, income, and livelihood. The value of the ecosystem services of mangroves in particular outlines the potential for payments for ecosystems services.

Research[17] into the value of these coastal blue carbon ecosystems found mangroves provide Solomon Islands coastal communities with one quarter of their weekly food and cash incomes. For example, mangroves as a source of food and timber were estimated to have an annual household value of USD356 to 1525. The subsistence and cash derived from the fisheries benefiting from mangroves was estimated to be USD784-1724.

The research project recommended using existing frameworks to promote carbon potential in coastal blue carbon ecosystems. In particular, it describes how REDD+ projects could leverage the existing legal framework of the Solomon Islands, such as the Protected Areas Act, to develop a sustainable management plan and formally register the area for protection. This would address a key component of successful blue carbon projects to establish clear and defensible land and marine tenure.

Calagatan mangrove

Other relevant policy frameworks

Ramsar Convention on Wetlands	The Ramsar Convention covers a broad definition of wetlands, including those relevant to coastal blue carbon ecosystems such as seagrasses, tidal marshes, mangroves and other coastal areas. At the time of writing, the Convention was investigating approaches for supporting greater action on blue carbon, via resolutions or scientific investigations.
Regional Seas Programme	UNEP's Regional Seas Programme adopts a "shared seas" approach – namely, by engaging neighbouring countries in comprehensive and specific actions to protect their common marine environment. More than 143 countries have joined 18 Regional Seas Conventions and Action Plans for the sustainable management and use of the marine and coastal environment.
Convention on Biological Diversity	UNEP's Convention on Biological Diversity is an international legally-binding treaty with three main goals: conservation of biodiversity; sustainable use of biodiversity; fair and equitable sharing of the benefits arising from the use of genetic resources.
United Nation's 2030 Sustainable Development Agenda (SDG)	As part of its follow-up and review mechanisms, the UN's 2030 Agenda for Sustainable Development encourages member states to conduct regular and inclusive reviews of progress at the national and sub-national levels, which are country-led and country-driven (paragraph 79). The Sustainable Development Goal 14 requests countries to conserve and sustainably use the oceans, seas and marine resources for sustainable development. Targets 14.2 and 14.3 are particularly relevant for coastal blue carbon ecosystems as they address their management and protection, and their potential to reduce ocean acidification.

CASE STUDY

China

National level action on coastal blue carbon ecosystems is included in China's 13th Five-Year work plan for greenhouse gas emission control by the State Council. The Five-Year plan promotes a cleaner and greener economy. It charts a sustainable course for the economy in the long-term and China's global role in curbing greenhouse gas emissions. With these drivers in mind, China's State Oceanic Administration has begun a pilot scheme on coastal and ocean ecosystem carbon sinks.

Local provinces also play a role in managing China's coastal ecosystems. For example, in Jiangsu province China's largest salt marsh habitats are conserved in two national natural reserves. The Jiangsu Province has drafted a plan to ensure salt marshes, macroalgae and shellfish are conserved and developed. The plan's higher level objectives are sustainable development and to advance 'eco-civilisation' – a more balanced focus on ecosystems and the environment alongside economic development.

Managing coastal blue carbon ecosystems

A number of jurisdictions are developing projects to manage coastal blue carbon ecosystems, covering the full spectrum of ecosystem services from fisheries to climate change mitigation.

Existing knowledge of blue carbon and the state of the enabling environment will have a great influence on how countries consider blue carbon in relevant policy, legal and regulatory frameworks.

Policy-makers can initiate blue carbon projects using a variety of different policy or framework 'triggers' – for carbon sequestration, coastal zone management, or to support local fisheries.

To date, many of these projects are managed at a local level on behalf of funding partners, including NGOs, government institutions, academia, international organisations, foundations, and the private sector. The driving objectives of projects vary, but collectively they contribute to achieving valuable outcomes for accelerating action on blue carbon, including by:

- addressing scientific knowledge gaps
- facilitating availability of local environmental data
- guiding direction of policy and economic instruments
- improving understanding of ecosystem services
- supporting integrated coastal management with particular emphasis on climate change mitigation and adaptation, and
- testing and developing optimal management approaches.

Mangrove field work

CASE STUDY

Community-led implementation Mikoko Pamoja, Kenya

The Mikoko Pamoja community-led carbon project demonstrates the success of a community-based management approach. The project aims to conserve, manage and restore 117 hectares of mangroves at Gazi Bay on the south coast of Kenya. The project area represents 20 per cent of the total mangrove area in Gazi Bay. All mangrove areas in Kenya are nationally owned[18]. The mangroves provide important benefits to the Gazi Bay community, eighty per cent of whom derive their livelihoods from fishing-related activities. Benefits include coastal protection, tourism and building materials, although injudicious extraction of timber has led to degradation and deforestation of some mangrove areas[19].

A key Kenyan Government researcher who is also a long-term resident of the community, cultivated strong community support for this project. This included implementing training for the local community, as well as promoting other sources of mangrove-related income, such as beekeeping and ecotourism, and distribution of profits to support projects of collective benefit to the community. This project has led to well established and ongoing scientific research in the region and government support for the local community. All of this local community action is underpinned by a supportive national policy that promotes participatory forest management[18].

The project is being replicated and up-scaled in Vanga Bay, Kenya, with support from the Global Environment Facility (GEF) through the UN Environment Blue Forests Project.

Blue carbon financing and investment

There are a number of funding sources that can finance coastal blue carbon ecosystem restoration projects. While many funding mechanisms currently exist, particularly in certain jurisdictions, there is a great opportunity for innovative financing solutions and more sustainable funding sources to be established with the aim of advancing action on blue carbon.

Sources of funding

Government funding/development banks

The vast majority of funding to support blue carbon protection and restoration is available through international and regional funds from the World Bank and United Nations.

For example, the Global Environment Facility (GEF) funds are available to developing countries and countries with economies in transition, to meet the objectives of international environmental conventions and agreements. GEF support is provided to government agencies, NGOs, private sector companies, research institutions, among the broad diversity of potential partners, to implement projects and programs in recipient countries.

The World Bank also has a range of Funds that can be accessed, including the Adaptation Fund, the BioCarbon Fund, the Forest Investment Fund, the Global Facility for Disaster Reduction and Recovery, and the Least Developed Country Fund. Each of these funds have particular programs and criteria which must be met, but with increasing recognition of the importance of blue carbon ecosystems to climate mitigation efforts and for other ecosystem services, the opportunities to access them for blue carbon projects is similarly increasing.

The Green Climate Fund (GCF), established under the UNFCCC, is another potential option to finance blue carbon projects. The GCF supports projects, programs, policies and other activities in developing countries as a way of transferring money from the industrialised to the developing world for adaptation and mitigation practices[20].

The advantage of these funds is the ability to access expertise and oversight from the Funds managers, as well as access to the global network of project proponents and participants from other projects that can be an important source of advice and 'lessons learned'.

Some countries have elected to establish national climate funds, which may also provide an opportunity to fund blue carbon restoration or protection projects.

Regulated and voluntary carbon markets

Carbon markets involve the creation of carbon offsets and/or allowances that are used as part of a compliance scheme — for example, a national or regional emissions trading or offset scheme — and for voluntary programs. There are currently no blue carbon mitigation projects that generate carbon credits for use in compliance programs. This will require further analysis of blue carbon projects being undertaken, and a focus on building emissions measurement capacity.

Voluntary carbon markets enable businesses, governments, NGOs, and individuals to offset their emissions by purchasing what are typically referred to as voluntary emissions reductions. While the price of credits on the voluntary market is typically lower, it is a good environment to test new procedures, methodologies and technologies. There are a small number of projects on coastal blue carbon ecosystems that are generating credits on the voluntary market.

For both compliance and voluntary markets in blue carbon to be developed further, significantly more research, analysis and demonstration projects need to be supported so that a rigorous and robust evidence base can be developed to support blue carbon markets. In essence, this is a rapidly emerging opportunity for carbon mitigation, but strong evidence needs to be gathered to ensure project proponents (carbon creditors) and project funders (credit purchasers) can be confident in accurately measuring abatement, and in the broader environmental integrity of blue carbon projects.

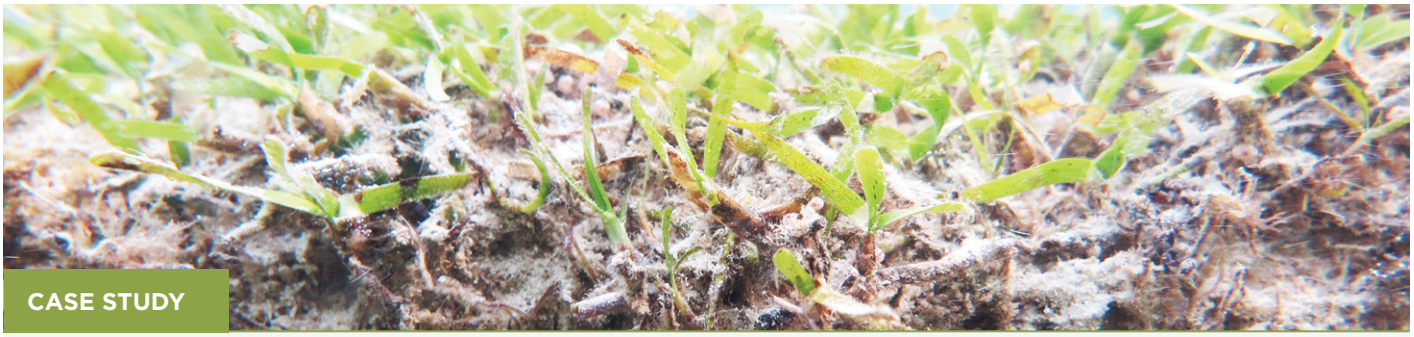
Other non-market funding options

Other non-market funding options include philanthropy such as grants from private or business foundations, and large NGOs, or Overseas Development Assistance (ODA). With philanthropic funding, each organisation/foundation has its own application schedule and requirements depending on the drivers of the organisations philanthropic efforts[1]. Debt-swap/relief and conservation initiatives are also available to assist highly-indebted countries with their environmental efforts.

CASE STUDY

Voluntary carbon market project in Madagascar

Madagascar is an example of blue carbon projects financed through a voluntary carbon market. The country has substantially increased its protected areas since 2003 with many coastal areas now included[8]. Along with this enhanced conservation, Madagascar has a dedicated institutional framework that allows better planning and enforcement. Through the Blue Forests Initiative, undertaken by Blue Ventures, local communities are developing carbon financing projects to conserve mangroves. Blue Ventures quantified the potential greenhouse gas emissions that could be reduced along with modelling to predict future wetland loss, and socio-economic impacts. The aim is to integrate conservation and restoration into Madagascar's REDD+ strategy and the use of voluntary carbon market standards across project sites[21]. The project is building the local community's scientific capacity through 85 local staff members, a mangrove soil laboratory at the University of Antananarivo, and community carbon monitors. The Blue Ventures initiative has also engaged the community through education and alternative livelihoods.



CASE STUDY

Seychelles

In February 2015, the Government of Seychelles completed a USD21.6 million debt swap with the Paris Club, with technical support from The Nature Conservancy. This committed the government to place 15 per cent of its Exclusive Economic Zone under marine protection by the end of 2017, and a total of 30 per cent (around 400 00 kms) by the end of 2020 (up from less than 1 per cent currently). The Seychelles' Conservation and Climate Adaptation Trust (SeyCCAT) was established to administer the debt swap proceeds and repayments, and manage the debt service savings in the form of a revolving Blue Grants Fund and a Blue Endowment Fund.

As well as committing the government to direct marine protection, the debt swap activity aims to secure a sustainable flow of funds to support the long-term management of the Seychelles network of Marine Protected Areas (MPAs), sustainable fisheries, and other activities that contribute substantially to the conservation, protection and maintenance of biodiversity, and adaptation to climate change. SeyCCAT will disburse USD280 thousand annually via the Blue Grants Fund, with a first call for proposals scheduled at the end of 2017.

Alongside the debt swap process, the Government of Seychelles will be issuing a sovereign blue bond worth USD15 million in early 2018. Through the technical support of Prince Charles Charities International Sustainability Unit (ISU) and Guarantees from the World Bank and the Global Environment Facility recently endorsed by the World Bank Board, the blue bond is expected to attract strong private investment. The proceeds of the Blue Bond will be disbursed in the form of a Blue Grant Fund through SeyCCAT and a Blue Investment Fund as loans through the Development Bank of Seychelles to encourage a shift towards sustainable fisheries practices and job creation. Funding will support improved fisheries management and stock rebuilding activities and diversification of the fisheries sector, focusing on post-harvest value chains and services.

Next steps - raising awareness, sharing knowledge and accelerating practical action

Coastal blue carbon ecosystems present countries with many opportunities - to sequester and store carbon, enhance coastal resilience, foster sustainable livelihoods and contribute toward their climate change commitments.

The diversity of projects that are underway across the globe – some of which have been highlighted here – provide useful examples of how governments and their partners can accelerate action to protect and restore blue carbon ecosystems in the coming years.

There has been considerable work by international, national and local groups to establish the science behind blue carbon ecosystems, and to develop protocols and guidelines for how to achieve climate mitigation and adaptation outcomes alongside important co-benefits. As the case studies presented here have demonstrated, having a solid base of research (which could include a better understanding of national blue carbon ecosystems' stocks and storage potential) is useful in guiding the inclusion of blue carbon in relevant policies, plans and management actions.

The successful development and implementation of more rigorous policies, and projects of a greater scale, will rely on continuing to integrate priorities for coastal blue carbon ecosystems into existing frameworks and taking advantage of established systems, methods and processes. Across the world, countries are already moving to include coastal blue carbon ecosystems in their NDCs under the Paris Agreement. This is just one policy mechanism by which countries can step-up their practical action.

There is no one single best approach to implementing meaningful policies and actions on coastal blue carbon ecosystems. Governments and their partners will need to determine which path is right for them based on their own national circumstances and priorities.

This means blue carbon carbon activities should be designed in a way that is tailored to the existing level of knowledge, awareness and country or site specific conditions. This is important in order to identify the policy and practical actions that will have the greatest impact. Experiences in terrestrial environments offer some lessons, especially in relation to how frameworks such as REDD+ have been implemented, and the foundations they have laid in setting up existing programs and identifying partners.

We also know through experience that community based approaches and projects implemented with support from coastal communities are important for achieving the greatest human and environmental outcomes and securing the long-term success of blue carbon projects. There is much to be learned from sharing knowledge and experiences with others.

With growing awareness of the importance of protecting and restoring blue carbon coastal ecosystems, governments and their partners can continue in earnest to harness the climate mitigation potential and adaptation benefits of these important environmental assets, and achieve the many important co-benefits associated with these valuable ecosystems.

Calagatan seedlings

Further information and resources

- Blue Carbon Initiative - global program co-organised by CI, IOC-UNESCO and IUCN working to mitigate climate change through the restoration and sustainable use of coastal and marine ecosystems – focusing on mangroves, tidal marshes and seagrasses.
- IUCN's National Blue Carbon Policy Assessment Framework - using a detailed assessment tool, coupled with field-testing in five countries, the National Blue Carbon Policy Assessment Framework provides countries with a straightforward, structured and easy-to-apply five-step assessment framework.
- Blue Forests - a global initiative focused on harnessing the values associated with carbon and other coastal ecosystem services to support climate resilient communities through improved ecosystem management and the mitigation of climate change.
- Blue Solutions - provides a global platform to collate, share and generate knowledge and capacity for sustainable management and equitable governance of marine ecosystems.
- The Global Mangrove Alliance - founded by Conservation International, The Nature Conservancy, and WWF to use their skills and networks to catalyse new investments to improve land use management and on-the-ground conservation, restoration and sustainable use of mangroves.
- Abu Dhabi Global Environmental Data Initiative (AGEDI) - established to address environmental knowledge gaps and facilitate quality environmental data being made available to policy-makers and authorities.
- Mangroves for the Future - promotes an integrated ocean-wide approach to coastal management and build the resilience of ecosystem-dependent coastal communities.
- SWAMP - provides policy-makers with credible scientific information needed to make sound decisions relating to the role of tropical wetlands in climate change adaptation and mitigation strategies.
- The Melanesian Spearhead Group (MSG) – a joint commitment to fighting climate change between five member nations.
- The Partnerships in Environmental Management for the Seas of East Asia (PEMSEA) – an intergovernmental organisation operating in East Asia to foster and sustain healthy and resilient oceans, coasts, communities and economies across the region.
- The Secretariat of the Pacific Regional Environment Programme (SPREP) - developed factsheets on blue carbon and wetlands and how these relate to the SDGs including SDG 14 Life below water.
- The Tropical Agricultural Research and Higher Education Center (CAITE) - published a policy and science document titled 'Blue Carbon A-Z: from small projects to policy development' to facilitate the development of sound scientific and political frameworks within the Latin America and Caribbean region.

Online data resources

- The Blue Carbon Initiative Library
- Blue Carbon Portal
- CSIRO Coastal Carbon Cluster
- Global Carbon Project
- Intergovernmental panel on Climate Changes' Task Force on National Greenhouse Gas Inventories
- Sustainable Wetlands for Adaptation and Mitigation Program (SWAMP) Toolbox
- Marine Ecosystem Services Partnership
- Mapping Ocean Wealth

Practical tools

- The UAE Blue Carbon Mapping Tool
- The Mapping Ocean Wealth Tool
- The Coastal Ecosystem Based Adaptation Decision Support Tool
- The Ex-Ante Carbon Balance Tool
- The Full Carbon Budget Model of the Canadian Forest Sector
- The Full Carbon Accounting Tool
- The Full Lands Integration Tool
- Global Forest Watch
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Gazi Bay, Kenya

Notes

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