

Including Coastal Ecosystems in Nationally Determined Contributions (NDCs)



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Key messages

- Inclusion of nature-based solutions in climate policies is gaining momentum (Seddon et al., 2020), but the potential of actions based on the ocean and its ecosystems to mitigate and adapt to climate change is still under-exploited (Gattuso et al., 2018).
- Actions based on coastal ecosystems (conservation, restoration and sustainable management) are often low-cost options, with multiple co-benefits for nature and a large range of stakeholders, including vulnerable communities.
- The round of NDC updates in 2020 and 2021 is an opportunity for the States to raise their climate ambition by including coastal ecosystems in their NDCs as a mitigation and adaptation solution, with co-benefits for biodiversity and human health.
- There is a need to assign measurable and robust targets to these actions. For adaptation, targets should aim to address specific vulnerabilities to climate change; for mitigation, they should be based on well-supported carbon estimates and accounting (Seddon et al., 2019).
- Nevertheless, nature-based solutions should not undermine efforts to urgently reduce greenhouse gas emissions in other sectors (IPCC, SROCC 2019). The massive reduction in emissions is a priority to mitigate the effects of climate change and thus increase the adaptive capacity of socio-ecosystems.



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(a) Mangroves (© Fanny Châles)



(b) Coral reefs (© James Hoyland)



(c) Seagrasses (© Barefoot Biogeochemistry)



(d) Salt-marshes (© INGO arndt/minden pictures/corbis)

FIGURE 1. Illustration of the different emblematic coastal ecosystems for mitigation of and adaptation to climate change: (a) mangroves, (b) coral reefs, (c) seagrasses, and (d) salt-marshes.

SUMMARY

The effects of climate change are growing and are already having dramatic consequences, particularly for coastal populations in developing countries (IPCC, 2018). In 2015, by adopting the Paris Agreement, the international community committed to reducing the magnitude of ongoing climate change through the development of national action plans, called Nationally Determined Contributions (NDCs). Five years after signing the Agreement, it appears that the States must undertake drastic efforts to raise their climate ambitions. The ocean, which plays a key role in stabilizing the climate, offers many mitigation and adaptation solutions (Gattuso et al., 2018). Among them, proper management, conservation and restoration of coastal ecosystems can help meet both the challenges posed by climate change and the decline in biodiversity, while increasing human well-being. This policy brief explores the challenges of the inclusion in NDCs of such actions based on emblematic coastal ecosystems: mangroves, coral reefs, seagrasses and salt-marshes (figure 1).

The Paris Agreement and NDCs: which commitments for which goals?

Mitigation, adaptation and financing goals

In 2015 at the COP 21, 196 States adopted the Paris Agreement, committing themselves to modifying their development trajectories in order to reduce the causes and the effects of climate change. The main goal of the Paris Agreement is to limit global warming to 2°C,

1.5°C if possible, by 2100 compared to pre-industrial levels. In its special Global Warming of 1.5°C report, the Intergovernmental Panel on Climate Change (IPCC) shows that net anthropogenic greenhouse gas (GHG) emissions must therefore fall to 0 by 2050 for global warming to be limited to 1.5°C in 2100 (figure 2).

The Paris Agreement includes two other goals: first, it aims to enhance the capacity of human populations to adapt to the effects of climate change, in order to increase their resilience. Secondly, the States have committed to providing \$100 billion per year to developing countries to help them meet their mitigation and adaptation goals. In order to achieve these goals, in 2025, countries started to draw up national action plans including climate targets and actions to reach them. **These action plans, called Nationally Determined Contributions (NDCs), are updated every five years starting in 2020, with an obligation on each occasion to be more ambitious in terms of emission reductions.**

Meeting climate commitments: where do we stand in early 2021?

Actions included in the first NDCs (drawn up between 2015 and 2019), will probably not be sufficient to reach the common goal of limiting global warming to 1.5°C by 2100. Even if all the climate pledges (including NDCs) were met, it is estimated that warming would reach approximately 2.6°C by 2100 (figure 2). And the assessment carried out in late 2020, five years after the adoption of the Paris Agreement, revealed that the emission reduction targets set in the NDCs have

not been achieved. Regarding adaptation, 75% of countries have set up adaptation plans by the end of 2020, but adequate funding to effectively implement them remains too low, in particular in developing countries, according to the UNEP Adaptation Gap Report (UNEP, 2021). The round of NDC updates, which began in 2020 and is continuing in 2021, represents an opportunity for countries to accelerate the transition towards a more sustainable world.

Why focus on coastal ecosystems in NDCs?

↘ **For their role in regulating the climate, by capturing “blue carbon”**

Mangroves, seagrasses and salt-marshes trap carbon in their roots and in the soil, and therefore contribute to mitigating climate change (this is not the case for coral reefs whose carbon net balance is neutral or even negative because they release about as much carbon as they capture (Howard et al., 2017). This is why these ecosystems are often referred to as “blue carbon ecosystems”. They have high carbon sequestration rates in their sediments, ten times higher than those of terrestrial ecosystems (Duarte et al., 2013). **Today, the quantity of carbon trapped and sequestered by these three types of ecosystems is estimated at between 10 and 24 billion tonnes** (Lovelock et al., 2020).

↘ **Because they contribute to strengthening the adaptation of human populations**

Until now, discussions around the inclusion of coastal ecosystems in NDCs have largely focused on their capacity to mitigate climate change, whereas their role in adaptation is crucial (UNEP, 2021). Indeed, coastal ecosystems provide benefits, also called “ecosystem services” in terms of adaptation to the various impacts of climate change. Climate change impacts include, among others, coastal erosion and submersion (putting at risk local fresh water supplies), extreme climate events such as flooding and cyclones, and the degradation or even the loss of some local essential resources such as fishery resources. More than half of the countries, including more than 90% of the least developed countries, consider the protection of nature to be an important motivation for adaptation planning (UNEP, 2021). **Given that 50% of the world’s population lives less than 100 km from the coast, and that coastal communities are particularly vulnerable to the impacts of climate change, implementing local solutions based on coastal ecosystems is all the more crucial.**

Global greenhouse gas emissions and warming scenarios

- Each pathway comes with uncertainty, marked by the shading from low to high emissions under each scenario.
- Warming refers to the expected global temperature rise by 2100, relative to pre-industrial temperatures.

Global greenhouse gas emissions

in gigatonnes of carbon dioxide-equivalents, per year

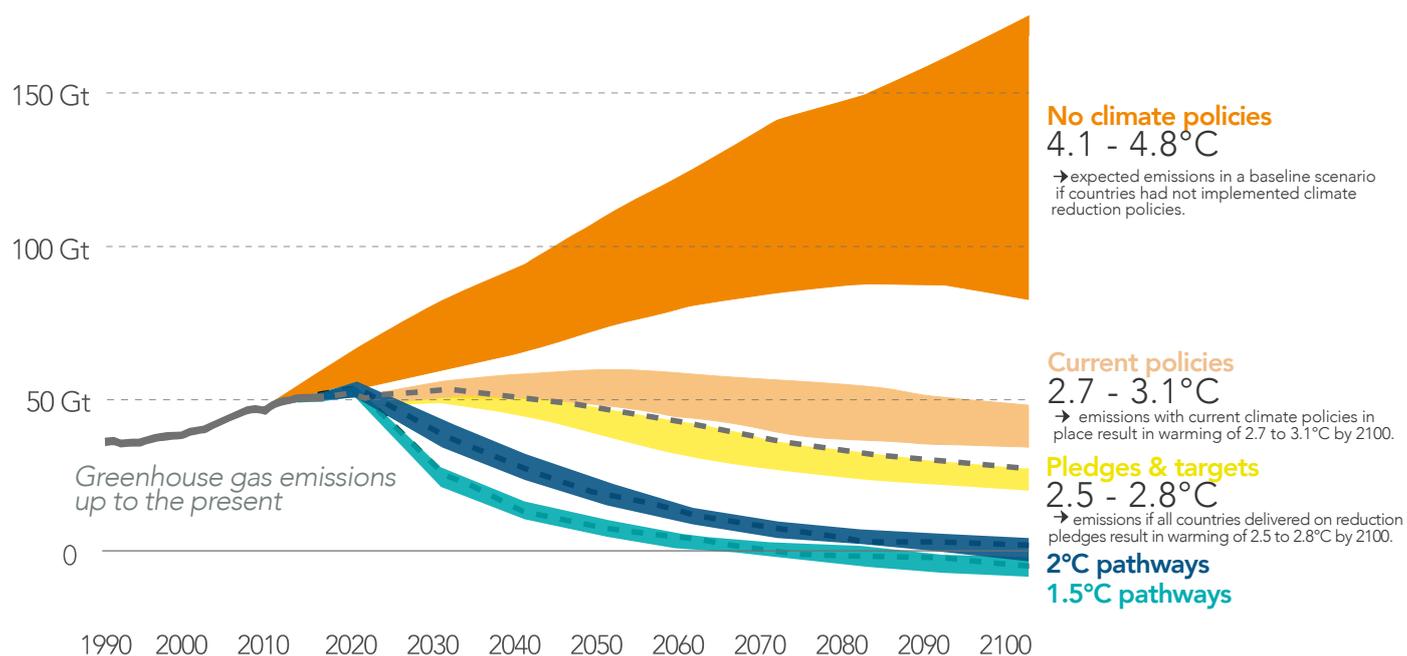


FIGURE 2. Global greenhouse gas emissions under different warming scenarios. Adapted from [Climate action tracker](#), 2020 (based on national policies and pledges of December 2020).

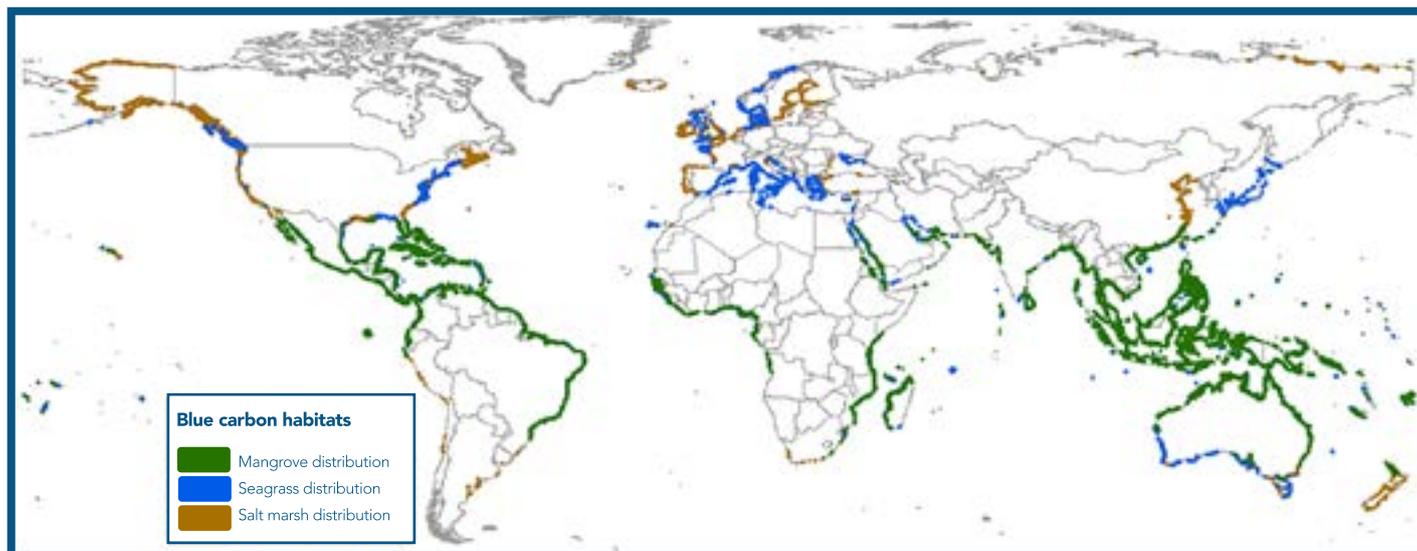


FIGURE 3. Global coverage of blue carbon ecosystems, including mangroves (in green), seagrasses (blue) and salt-marshes (brown). Source: Himes-Cornell et al., 2018. Mangroves and coral reefs are found mainly in tropical regions, whereas seagrasses and salt-marshes are more abundant in temperate regions.

- **Coastal protection:** mangroves, seagrasses and coral reefs form a natural buffer, absorbing wave energy, and therefore protect the coasts from erosion and submersion. They also reduce coastal exposure to storm winds (Bell and Lovelock, 2013). The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) estimates that between **100 and 300 million people are exposed to an increased risk of flooding and hurricanes due to the loss of these coastal ecosystems** (IPBES, 2019).

- **Conservation of biodiversity:** coastal ecosystems provide habitats for many marine species. In particular, coral reefs alone are home to more than 30% of marine species whereas they cover only 0.2% of the ocean (Reaka-Kudla, 2001).

- **Food supply and livelihoods:** the livelihoods of many coastal communities depend on fishery resources, which provide them with highly nutritious food and contribute to the economic and social development of communities (FAO, 2020). As living and breeding grounds for fish, coastal ecosystems are essential for food security in many coastal communities around the world.

- **Health and well-being:** by filtering and retaining pollutants, mangroves help maintain water quality. In addition, mangroves are used in traditional medicine (Malik et al., 2015) and corals are increasingly being studied for their therapeutic properties, bringing hope in the treatment of cancer. Coastal ecosystems have a high cultural value, strengthen social cohesion, and are places of recreation and contemplation, essential for human well-being.

↓ To protect biodiversity

Coastal ecosystems are home to abundant and diverse - but increasingly degraded, flora and fauna (IPBES, 2019). The loss and degradation of coastal ecosystems are increasing at an important rate: according to the IPCC, nearly 50% of coastal wetlands have been lost over the last 100 years, due to a combination of localized human pressures, sea level rise, warming and extreme weather events (IPCC, 2019). Given the context of the global loss of biodiversity, these ecosystems need to be protected (IPBES, 2019).

The role of coastal ecosystems recognized in international climate negotiations

It is only in 2015 (adoption of the Paris Agreement) that the ocean, “the glaring omission” in climate negotiations so far, started to gradually gain recognition on the international climate stage (Gallo et al., 2017; Guilloux, 2019). In its preamble, the Paris Agreement stresses the importance of “ensuring the integrity of all ecosystems, including oceans, and the protection of biodiversity”.

Including coastal ecosystems in NDCs

There is growing recognition of the strong interdependence between the global crises of climate change and biodiversity loss. Climate change is a major cause of biodiversity loss, while nature plays a fundamental role in both mitigating and adapting to climate change (IPBES, 2019). By focusing on the conservation or restoration of ecosystems and their sustainable management, nature-based solutions (defined by IUCN on the basis of eight criteria)

can therefore simultaneously address the ongoing climate-biodiversity challenges while contributing to human health and well-being. These solutions are increasingly recognized in national and international policies for their climate co-benefits (Seddon et al., 2020). However, the potential of ocean-based solutions, and in particular those based on coastal ecosystems, is still largely under-exploited in national climate strategies (Gattuso et al., 2018).

Overview of the inclusion of the ocean and its emblematic coastal ecosystems in NDCs

Among the initial NDCs (submitted between 2015 and 2019) analyzed by Gallo et al. (2017), 70% included ocean-related issues. While just over 150 countries in the world have mangroves, seagrasses, corals or salt-marshes, only 28 countries (19%) refer to them in their NDCs for mitigation purposes and 59 countries (39%) refer to them for adaptation purposes (Herr and Landis, 2016). Those countries that have included coastal ecosystems are predominantly Small Island Developing States (SIDS), as well as countries with a large proportion of their population living less than

five meters above sea level. However, although they have long coastlines and an extensive Exclusive Economic Zone, many developed countries such as the United States, Australia or European Union Member States, do not explicitly refer to coastal ecosystems in their NDCs (Gallo et al., 2017). The 31 categories in Figure 4 illustrate how countries included ocean-related issues in their first NDCs. In particular, the impacts and actions relating to coastal ecosystems (corals, mangroves, seagrasses, salt-marshes) are represented by the striped columns. Coastal ecosystems were included either contextually in the NDCs (orange striped columns) - countries recognizing the impacts that climate change may have on them; or as an action (or solution) (dark blue striped columns). For instance, the creation of marine protected areas (MPAs) was included as a climate solution into 17 NDCs. Mangroves were more often included than corals and seagrasses: 35 NDCs included actions related to mangrove management and 19 included actions related to their restoration or conservation; whereas only 4 NDCs included actions related to the protection and restoration of seagrasses, 3 related to the resilience of coral reefs, and 2 related to coral conservation.

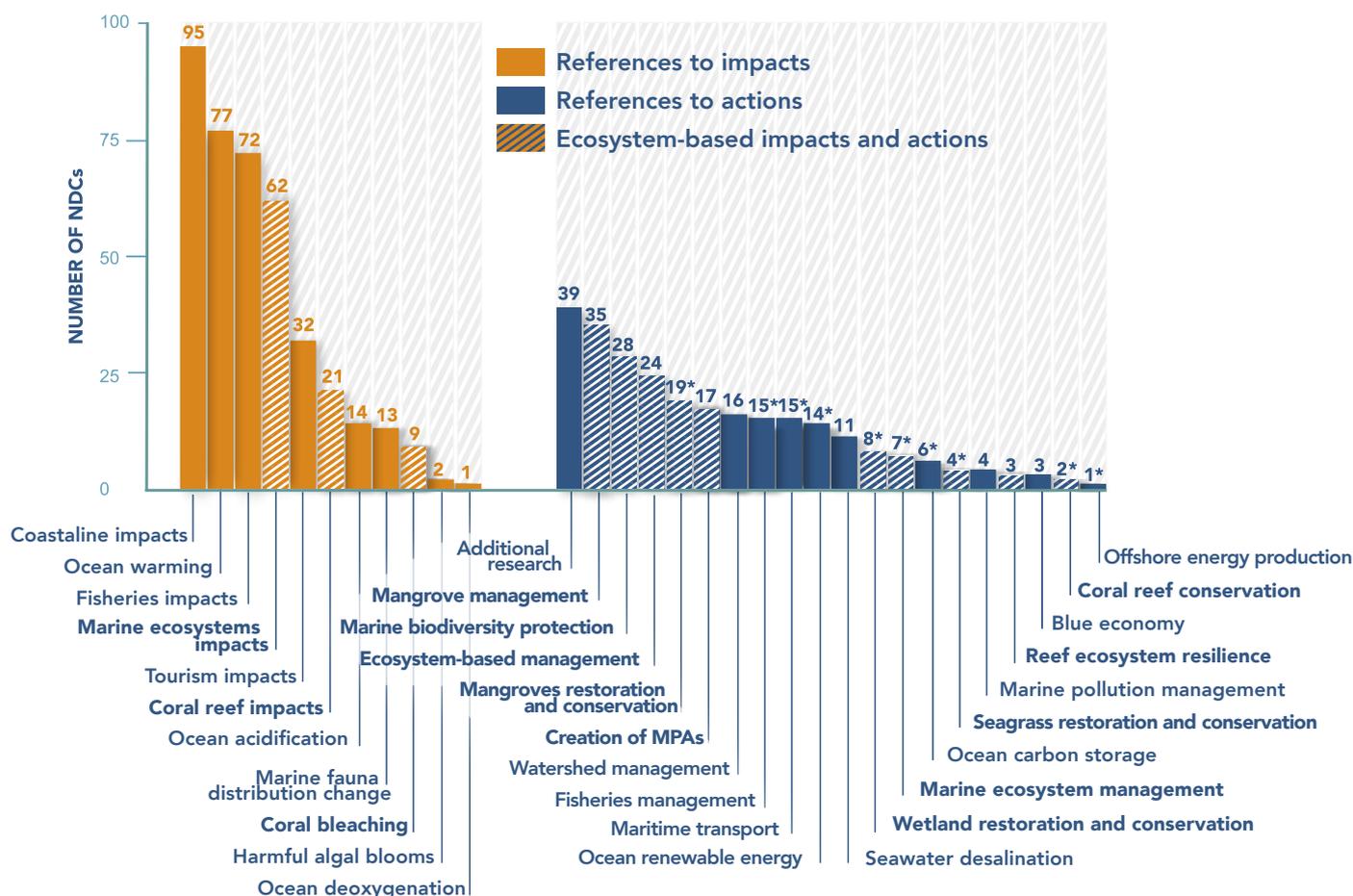


FIGURE 4. Overview of references to the ocean-related impacts (in orange) and actions (in dark blue) in the NDCs. Impacts or actions referring to coastal ecosystems correspond to the striped bars. Numbers above the bars represent the number of NDCs (out of 161 analyzed, of a total of 167 existing NDCs), for each category; numbers with an asterisk (*) indicate categories in the mitigation component of the NDCs. This classification results from a clustering exercise carried out by Gallo et al., (2017). This figure is adapted from the "SM1" figure in the Supplementary material of the Policy brief "Opportunities for increasing ocean action in climate strategy" produced by IDDRI (Gattuso et al., 2019).

Some solutions can be developed for climate change adaptation purposes, but with co-benefits for mitigation, and vice versa. For example, the Republic of the Marshall Islands has considered mangrove restoration as an adaptation action with co-benefits for mitigation through the enhancement of carbon sinks.

Opportunities to incorporate coastal ecosystems into NDCs

2020 and 2021: updating the NDCs in a global health crisis context

As of 2020 and every five years, countries must submit an updated NDC that must be an improvement on their previous NDC and correspond to their highest possible level of climate ambition (Paris Agreement, Art. 4.3.). According to the think tank World Resources Institute, 107 countries, representing 15.1% of global GHG emissions, have announced that they would revise their NDC ambition upwards by the end of 2020. In the context of the current Covid-19 pandemic, most countries were unable to submit their updated NDC in 2020 but continue to revise it in order to submit their updated NDC as soon as possible in 2021. Climate action has been hindered by the global health emergency but remains more essential than ever to increase our resilience to global changes, whether they be environmental, social, sanitary or economic.

From the NDC to concrete action

Integrated transcription into national policies

Developing and implementing an NDC is a complex process which requires coordination across ministries and sectors, policies and legislation, as well as a national carbon flux accounting system and financing resources. In particular, ecosystem-based solutions require inclusive governance and institutions to manage public goods, often related to land security and access rights. In many contexts, the success of sustainable management of coastal ecosystems depends on the engagement of local communities and their participation in decision-making and implementation processes. Since the content of the NDC is not legally binding under international law, it is how the content of the NDC is incorporated into the legislation of each State that actually determines the level of constraint. Indeed, the Paris Agreement does not provide for a system of sanctions in the event of non-compliance, but it does provide for a system of control and monitoring, and the possibility of "name and shame" (Art. 14 and 15 of the Paris Agreement, Art. 14 of the UNFCCC).

How to include coastal ecosystems in NDCs?

Many possibilities exist to include coastal ecosystems in NDCs. For example, actions to protect mangroves can be incorporated into the forest financial mechanisms of the Convention on Climate Change (UNFCCC) such as REDD+, or into LULUCF activities if a country defines its mangroves as forests. Regulations can also be put in place, for instance to limit pressures (such as coastal pollution) on coastal ecosystems. The creation of marine protected areas can also be an effective tool to preserve the health of these ecosystems. The inclusion of ecosystem-based actions in NDCs can also create synergies between existing policies, laws and plans, and enhance their scope.

Accounting for blue carbon fluxes

In order to develop appropriate policy responses and to provide accurate numbers in global and national GHG accounts, blue carbon ecosystems need to be included in the UNFCCC's global GHG inventories. Including blue carbon in the NDC implies the ability to measure the carbon fluxes captured and emitted by blue carbon ecosystems (mangroves, seagrasses and salt-marshes). The IPCC Wetlands Supplement (2013, refined in 2019) provides the reference methodology to account for these fluxes, to monitor them over time, and to report and verify them (IPCC, 2013).

Mobilizing funding to protect coastal ecosystems

For many countries, international funding support is necessary to implement their NDCs, but accessing these funds sometimes requires significant technical and financial resources and remains a major challenge. Ecosystem-based actions offer the advantage of often being low-cost options with multiple co-benefits for biodiversity and human communities. They are generally more cost-effective than the use of artificial technologies or corrective measures once natural functions have been degraded (UNEP, 2021). **Major international climate funds (including the Global Environment Facility, the Green Climate Fund, the Adaptation Fund and the International Climate Change Initiative) are increasingly directing their funding at support for nature-based solutions.** Nevertheless, despite the increase in funding, its levels remain low. Diversifying and expanding the supply of funding as well as facilitating conditions to access funds are therefore priorities to meet the challenges of financing climate actions based on coastal ecosystems (UNEP, 2021).

The importance of conserving and managing coastal ecosystems in an integrated way

An integrated approach that takes into account the diversity of activities in the coastal zone is recommended to sustainably manage coastal ecosystems (Herr and Landis, 2016). Taking into account the synergies between different ecosystems is also important in order to support the services they provide: for instance, living corals, seagrasses and mangroves provide higher services of coastal protection than any individual habitat or any combination of two habitats (Guannel et al., 2016). Furthermore, adaptive management allows for adaptation to changes within these constantly evolving socio-ecosystems (IUCN, 2020).

Risks and challenges associated with the inclusion of coastal ecosystems in NDCs

Uncertainties in measuring carbon fluxes

Although the function of carbon capture and storage by mangroves, seagrasses and salt-marshes is scientifically recognized, uncertainties remain in measuring their carbon fluxes. In particular, the amount of carbon stored in these blue carbon ecosystems varies significantly over time and space, requiring further research to determine how to measure and monitor these fluxes locally (Fyson et al., 2019).

Could focusing on blue carbon solutions have a detrimental effect on fossil emission reductions?

The capacity of coastal ecosystems to mitigate climate change may, in some countries, totally offset national emissions: this is the case of a quarter of tropical countries (Griscom et al., 2020). **Consequently, it is important to remember that a focus on blue carbon in NDCs should not divert attention away from the need to mitigate GHG emissions in other sectors** (Fyson et al., 2019).

Towards a reduced mitigation and adaptation capacity of socio-ecosystems in the future?

Coastal ecosystems are degraded and destroyed at the global scale due to land acquisition (mainly for construction, logging and conversion to aquaculture farms), land and marine pollution, coastal development and climate change. These impacts are projected to continue and will likely be exacerbated by climate change and population growth (IPBES, 2019; Hoegh-Guldberg et al., 2017). In particular, a 1.5°C increase in global temperatures could lead to an almost total loss of tropical corals; and a 3°C or more increase could result in high to very high risks for the majority of coastal ecosystems (IPCC, 2019).

- **Reduced resilience of coastal ecosystems in the future:** the greater the pressures on ecosystems, the lesser their resilience. In particular, the greater global warming is, the less effective protection and restoration actions are; for example, coral conservation and restoration are likely to be ineffective if warming exceeds 1.5°C (IPCC, 2019).

- **Limits to mitigation:** the rate of blue carbon ecosystem loss is estimated to be 2-7% per year. At current rates of loss, **30-40% of salt-marshes and seagrasses, and nearly 100% of mangroves, could disappear within the next 100 years** (Pendleton et al., 2012).

Degradation generates CO₂ emissions: when these eco-systems are degraded or destroyed, the carbon that was sequestered in the sediment is released. Every year, billions of tonnes of CO₂ are released from degraded or destroyed coastal ecosystems, equivalent to 1.02% of the world's tropical deforestation emissions (Pendleton et al., 2012).

Degradation reduces the capacity to absorb CO₂: in addition to causing CO₂ emissions, this degradation reduces the capacity of these ecosystems to ensure carbon sequestration.

- **Limits to adaptation:** once degraded or lost, coastal ecosystems can no longer provide any other services essential for biodiversity and human populations.

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OCEAN UNIVERSITY INITIATIVE

The Ocean University Initiative was initiated by the local authorities in Brittany. It is implemented by the University of Brest (UBO) with the aim of creating the conditions for establishing in France of an institute of the United Nations University dedicated to the ocean and the coasts, and with the means to carry out pioneering work in three areas: research, training and communication.

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