



POLICY BRIEF
**NATURE-BASED SOLUTIONS TO
CLIMATE CHANGE: TOWARDS
A BLUE CARBON ECONOMY
FUTURE**



Task Force 2
CLIMATE CHANGE AND ENVIRONMENT

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موجز السياسة حلول تغيّر المناخ القائمة على الطبيعة: نحو مستقبل اقتصادي قائم على الكربون الأزرق

فريق العمل الثاني
تغيّر المناخ والبيئة



المؤلفون
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ABSTRACT

Oceans are both the greatest victims of climate change and its greatest mitigators. This policy brief urges the G20 to strengthen the role of blue carbon (BC), nature-based solutions (NbS) and ecosystem-based adaptation (EbA) at international forums and initiate funding mechanisms for their implementation. The G20 can further ocean science by including BC targets at the United Nations Framework Convention on Climate Change and Convention on Biological Diversity, encourage countries to include these in Nationally-Determined Contributions and biodiversity targets, manage Marine Protected Areas through common international mechanisms, implement NbS to protect coastal ecosystems from pollution and enhance climate adaptation through EbA.

تعد المحيطات، من ناحية، من بين أكبر ضحايا تغيّر المناخ، ومن ناحية أخرى، تُعد من أكبر العوامل التي تحدّ منه. ويحثّ موجز السياسات هذا مجموعة العشرين على تعزيز دور الكربون الأزرق (BC) والطحول القائمة على الطبيعة (NbS)، والتكيّف المستند إلى النظم الإيكولوجية (EbA) في المنتديات الدولية وطرح آليات التمويل لتنفيذها. ويمكن لمجموعة العشرين أن تعزّز علم المحيطات من خلال تضمين أهداف الكربون الأزرق (BC) في اتفاقية الأمم المتحدة الإطارية بشأن التغير المناخي واتفاقية التنوع البيولوجي، وتشجيع البلدان على تضمينها في الإسهامات وأهداف التنوع البيولوجي المحددة وطنياً، وإدارة المحميات البحرية (MPAs) من خلال الآليات الدولية المشتركة، وتنفيذ الطول القائمة على الطبيعة (NbS) لحماية النظم البيئية الساحلية من التلوث، وتعزيز التكيف مع المناخ من خلال التكيف المستند إلى النظم الإيكولوجية (EbA).



CHALLENGE

This policy brief identifies four main challenges:

- 1. The impacts of climate change, coupled with other anthropogenic environmental pressures, multiplies adverse impacts on the health of "ocean biodiversity,"** leading to poor ecosystem functions, carbon capture, and sequestration.
- 2. Increased pollution from urban and rural areas** from waste, sewage, nutrients, and contaminated industrial run-off leads to degradation of marine ecosystems.
- 3. Mega-trends, such as rapid population growth,** result in high resource consumption that impacts the availability and quality of resources like intertidal land for mangrove habitats, fish stocks, and coral reefs for sustainable development.
- 4. Implementation of international agreements and new biodiversity goals post-2020 may be delayed or compromised altogether, partially due to the COVID-19 pandemic,** creating limited global protection for marine ecosystems, higher carbon emissions, and pollution, leading to adverse impacts on ocean health, particularly in high seas that are not under political jurisdiction.

Oceans are among the greatest victims of climate change; they are threatened by rising concentrations of CO₂, rising temperatures, falling oxygen causing rising acidity, all of which raise sea levels and increase the risks of flooding in coastal communities. These climate change pressures further impact ecosystems by drowning wetland habitats due to rising sea levels, bleaching coral reefs that may ultimately be lost if the planet warms by 2°C, proliferations of harmful algae, hypoxia or reduction in oxygen levels that suffocate marine animals and habitats, temperature rise which harms calcifying animals, and disruption of fisheries affecting local livelihoods and global food security (IPCC 2019).

1. We also want to point out the empirical uncertainty about whether the existing system has resulted in an increase in FDI flows.

CHALLENGE

Oceans are also the largest active carbon sink on Earth, with management of marine ecosystems offering great climate mitigation and adaptation opportunities (Duarte et al. 2013). Vegetated coastal habitats, such as mangroves, sea marshes, seagrass beds, and kelp forests provide climate adaptation and resilience to local communities (Duarte et al. 2013), especially in developing countries who depend largely on natural resources ecosystem services (Vignola et al. 2012), (Vignola, Locatelli, Martinez, & Imbach, 2012), as shown in Figure 1. Degradation of vegetated coastal habitats impairs their natural functions and ecological services. Rapid degradation of mangroves and coastal ecosystems that accumulate carbon in layers of sediment and biomass of plants can release large amounts of CO₂ into the atmosphere (Duarte et al. 2013; Kauffman et al. 2011.) Therefore, maintaining the health of our oceans and coastal ecosystems is not only important for our livelihoods and global food security but is also a cost-effective strategy for climate mitigation and adaptation co-benefits.

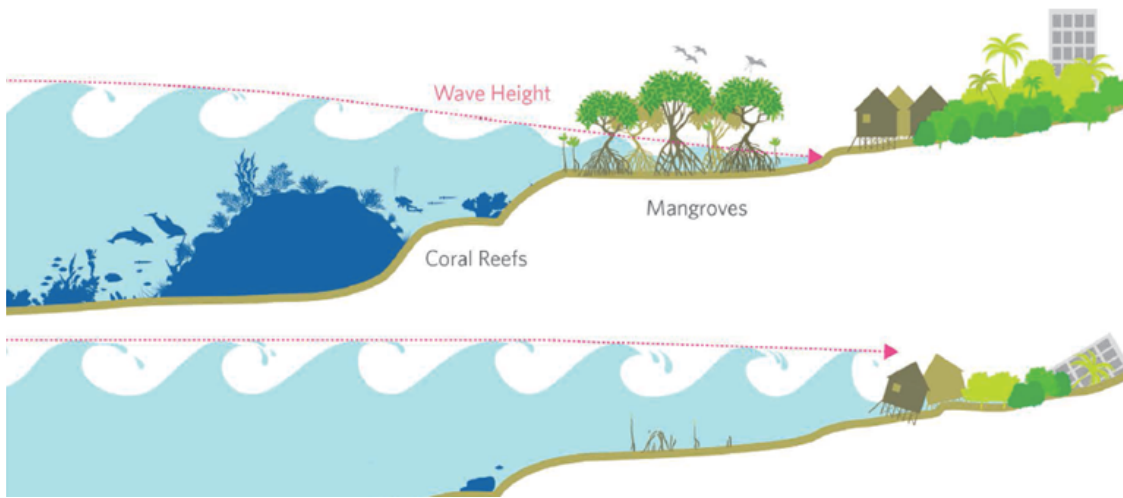


Figure 1: Coastal ecosystems mitigating risks.

Source: Losada et al. 2018

CHALLENGE

Approximately 1% of mangroves' global coverage is lost annually. To date, 67% of mangroves have been lost or degraded worldwide, and if this trend continues, all unprotected mangroves could be lost in the next 100 years (IUCN 2017). However, there is recent evidence of reduced loss speed, and expansion of mangrove forests in some regions (Duarte et al. 2020). Coastal blue carbon ecosystems can store a high amount of carbon in the biomass of plants and, particularly, in soils (Duarte et al. 2013). As a general estimate, mangrove soils contained approximately 70% of the ecosystem's carbon stocks (Kauffman et al. 2011). Vegetated coastal habitats accumulate sediment deposits up to six meters deep in a millennium (Duarte et al. 2013). However, these stocks become unstable when the plant cover is degraded or lost, therefore releasing high amounts of CO₂ (Lovelock et al. 2017).

Indeed, the science of blue carbon (BC) and its economy remains understudied; it deserves discussion from policy makers at the international level. Ecological systems such as fish stocks, coral reefs, beaches, and mangrove forests are recognized as underlying and sometimes invisible assets (Patil et al. 2016). Contribution of coastal and ocean carbon sinks to global carbon budgets must be mainstreamed (Duarte 2017). Hence, this policy brief aims to create a more conducive global environment for the conservation and preservation of ocean and coastal ecosystems by addressing the need for empirical scientific evidence, governance, policies, and institutional features that can be acted upon by the G20 member countries. Moreover, cross-cutting studies that demonstrate causal links between pollution, climate change mitigation, and ocean biodiversity conservation are required.

Over the years, around 35 international and regional conventions relating to oceans have been agreed upon by states, some of which are voluntary, and many have been ratified. Prominent international conventions are: the Convention of Biological Diversity's (CBD) Aichi Target 11, the Convention on International Trade in Endangered Species of Wild Fauna and Flora, the Ramsar Convention on Wetlands, the United Nations Law of the Sea Convention, the UN's Sustainable Development Goal 14, and the UNFCCC for climate change. Agencies like the International Union for Conservation of Nature (IUCN), the Marine Conservation Institute, and the World Bank have launched programs like the Blue Carbon Initiative, the Global Ocean Refuge System, and PROBLUE.

The political challenge for the G20 is to work with existing conventions and platforms to enable the identification of international conservation priorities for oceans, add to the dialogue and existing programs, and mobilize funds to protect marine ecosystems in high seas, as well as addressing the challenges involved in implementing the targets of SDG 14 and Aichi Target 11.



PROPOSAL

The COVID-19 pandemic, which has led to the cancellation of both Climate COP26 and Biodiversity COP15, has impacted the momentum of the UNESCO-declared Decade of Ocean Science and Sustainable Development (2021–30). Hence, the Saudi G20 2020 Presidency must fill the gap in effective multilateralism and play a substantial role in the conversation regarding ocean health and biodiversity.

This policy brief urges the G20 to strengthen the role of BC, nature-based solutions (NbS), and ecosystem-based adaptation (EbA) at international forums and initiate funding mechanisms for their implementation. The G20 can further ocean science by including BC targets at the UNFCCC and the CBD, encouraging countries to include these in nationally determined contributions (NDCs) and biodiversity targets, managing Marine Protected Areas (MPAs) through common international mechanisms, implementing NbSs to protect coastal ecosystems from pollution, and enhancing climate adaptation through EbA.

It is essential to build on previous key recommendations from past G20 summits for global ocean governance and ocean economy dialogues (Teleki et al. 2017) and international initiatives such as the High-Level Panel for a Sustainable Ocean Economy and others.

Proposal I

Provide stewardship for ocean science, knowledge, and technology by committing to creating a stand-alone G20 Technical Working Group on blue carbon economy, ecosystem-based adaptation, and nature-based solutions

The G20 must focus on enhancing the implementation of international and regional agreements, creating consorted governance actions, strengthening institutions, and facilitating cooperation for the protection and restoration of marine ecosystems in a holistic manner. In concrete terms, this will be enabled by the creation of a Blue Carbon Economy G20 Working Group, which would allow G20 countries to enact technical, political, financial, and institutional initiatives to conserve oceans and promote NbSs for climate change adaptation. Leading international research institutions from both developed and developing nations within this block must be brought on board to provide technical input. The working group can coordinate among the G20 countries to exchange scientific information and for technology deployment.

Oceans are a source of economic activity and food security for local populations. All G20 countries have significant coastal and marine ecosystems, which are critical to species diversity and therefore need protection. These include the Great Barrier Reef

in Australia; mangroves, corals, and seagrasses in the Indian Ocean; phytoplankton and inter-tidal flats in Canada; estuaries, beaches, mudflats, and corals in Indonesia; and the estuaries and intertidal areas in Italy. This reiterates that the G20 as a block can and should play a significant role in international ocean governance.

The G20 has been instrumental in creating economic agendas for global action. BC and its valuation are an important environmental and climate concern that requires further international consensus. The Working Group's technical experts and funds can systematically substantiate this agenda at various platforms, including the CBD, the UNFCCC and the SDG Knowledge platform. In 2003, as the world's first global budget of carbon storage was brought forth, the role of carbon storage in soils of salt marshes and mangroves highlighted the importance of coastal ocean sinks (Macreadie et al. 2019). However, coral ecosystems and seagrasses have been understudied. It is necessary to improve the scientific understanding of the underlying mechanisms that control BC in the ocean and coastal ecosystems. Improved methods for measuring BC storage and quantifying carbon storage rates in vegetated coastal ecosystems will help inform regional and global carbon management and potential carbon offset schemes (Mcleod et al. 2011).

Additionally, the impact of land-based waste, wastewater and plastics pollution on marine ecosystems in coastal areas and high seas requires attention. UNEP's Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities is one of the few inter-governmental mechanisms addressing land-base pollution directly to meet SDG 14.1. The World Bank's PROBLUE program identifies marine pollution from land-based sources as one of its pillars for implementation. Ecosystems can either be left unprotected or can be impacted due to trans-boundary environmental hazards like waste, floating debris, or plastics. In 2008, the European Union adopted the Marine Strategy Framework Directive, and other countries, including Japan and Australia, initiated legislation to regulate plastics in oceans. Plastics and waste can travel through ocean currents, impacting trans-boundary ecosystems. Further, fish stocks can be affected by sea-bed trawling, overfishing, and oil-spills. Moreover, wastewater and grey water discharge to marine ecosystems is the responsibility of nations. Many developing nations still lack adequate sewerage and wastewater treatment systems due to financial and capacity challenges.

This policy brief urges the G20, through the proposed Working Group, to encourage member countries to adopt in-country legislation, especially since plastics were declared hazardous by the United Nations in 2019. Programs that abate land-based

pollution need support, particularly in developing countries, which the Working Group can provide through special emphasis on scientific studies and impetus to implementation.

Another argument toward formulating this Working Group is that ecosystems are frequently regionally linked; most, like the Ross Sea Region Marine Protected Area in Antarctica are in high seas that are out of country-level political jurisdiction. The conception and implementation of scientifically selected, effective, regional MPAs that integrates communities and NbSs enabling EbA will provide multiple co-benefits, including biodiversity conservation, supporting the economic needs of local communities, developing climate resilience, and fostering adaptation at the international level. According to the ICUN in 2020, EbA is a NbS that harnesses biodiversity and ecosystem services to reduce vulnerability and build resilience to climate change. It is defined as “the use of biodiversity and ecosystem services as part of an overall adaptation strategy to help people to adapt to the adverse effects of climate change” (Convention on Biological Diversity 2009).

The group's responsibilities may include:

- forging partnerships with other international groups on oceans and integration using existing mechanisms like the Convention of Biodiversity, SDG 14, the Ramsar Convention, the Blue Flag Initiative, and importantly, the UNFCCC and utilizing agencies like the IUCN and the World Bank;
- bringing together countries and research institutions for consensus building, including NbS, EBA, and BC in the climate debate;
- developing science base with institutions and country level input on: NbS, EbA, Blue Carbon, pollution prevention to marine ecosystems, ocean valuation in climate risk mitigation and adaptation, mobilizing BC finance, carrying out economic valuation of marine ecosystems, accentuating local economy, protecting human lives, and promoting country-level infrastructure in coastal zones for BC.

Proposal II

Enable implementation of national and regional Marine Protected Areas, Nature-based Solutions, and Ecosystem-based Adaptation for a Blue Carbon economy

Only four of all G20 countries protect more than 4% of their oceans in no-take reserves. Fourteen G20 nations protect less than 1% in no-take marine reserves (Shugart-Schmidt et al. 2015). With currently over 10,000 MPA worldwide, only 4% of the global ocean is effectively protected, and only 1.5% is covered by strict and permanent MPAs. When compared with the SDG 14.5, which states that 10% of the ocean should be conserved by 2020, the world economies are significantly below their goals. Conserving and preserving MPAs, including coastal marshes, inter-tidal areas, and wetlands, will increase and aid carbon sequestration; conserving and preserving MPAs in high seas will lead to long term food security and biodiversity along with carbon sequestration. Common international laws and regulations that are more binding in nature and have access to implementation funds must be formulated.

The G20, through the proposed Working Group, must aid in prioritizing actions to effectively monitor and regulate existing MPAs and add new protected areas with scientific, regional, and international significance through the support of international initiatives from institutions like the IUCN and in creating the impetus for more binding international instruments.

This policy brief brings to the notice of the G20 that restored wetlands recover lost carbon at rates up to 5 metric tons/ha/yr (Gleason et al. 2011). Mangroves, which in spite of representing only about 0.7% of tropical forests, are thought to store as much as 20 petagrams (10¹⁵gm) of carbon (Jones et al. 2014). Per unit area, tidal marsh restoration of ecosystems, like mangroves, is more efficient for removing carbon from the atmosphere than planting trees. These areas are extremely productive habitats that capture significant amounts of carbon from the atmosphere and store it in their soil. They also have low methane emissions because of the salinity of water, making their restoration an encouraging technique for reducing greenhouse gas emissions (Callaway et al. 2010). In addition, natural and restored coastal ecosystems have the potential to reduce community vulnerability to extreme weather events. Prioritizing most-effective solutions is necessary to conserve these ecosystems and maximize their benefits, enabling community economic and social gains.

NbSs are centered around the protection, restoration, and sustainable management of the world's ecosystem given their vital role in addressing the causes and consequences of climate change. NbSs for coastal and marine ecosystems must be integrated in NDCs to enhance climate mitigation and adaptation (Seddon et al. 2019). G20

governments must encourage mangrove and coastal ecosystem restoration in their countries through policy tools like incentives and regulation. These national measures will allow NGOs, planners, engineers, insurers, risk managers, and economists to scale up the restoration of mangroves and coastal ecosystems and include them in national adaptation, land use conservation, and coastal risk management measures. In country development plans, cost-benefit analyses and economic accounts must consider mangroves and coastal ecosystems.

Further, this policy brief urges the G20, through the proposed Working Group, to enable scaling up and sustaining the overarching agenda of EbA through strengthening policies, partnerships, and institutions in member countries for coastal and marine ecosystems.

There is a clear need for capacity building in the area of EbA, particularly in developing economies. EbA will often be the first line of defense against the impacts of climate change for the most vulnerable people. Healthy wetlands can immensely increase our resilience to climate change impacts such as storms, floods, or droughts. Additionally, due to their ability to store and slowly release water, wetlands can also be a vital lifeline in periods of extreme drought (Heath et al. 2000, 804).

At present, few detailed global frameworks and agreements exist regarding pollution abatement for wastewater and nutrients that impact mangroves and coastal ecosystems. Through SDG Target 14.1 in 2016, nations agreed to significantly reduce and prevent marine pollution of all kinds, including pollution from land-based activities. Awareness regarding reduce plastic pollution and marine litter have gained momentum due to their trans-boundary impacts; however, in-country coastal pollution management of wastewater from anthropogenic sources needs attention. The G20 must provide impetus to control pollution from land-based sources to coastal and marine ecosystems by strengthening the international governance of SDG 14.1.

The G20 must encourage governments regarding pollution prevention and monitoring of coastal waters by using NbS to complement hard engineering. NbS, such as a constructed wetland, is an engineered sequence of water bodies designed to filter and treat waterborne pollutants found in sewage, industrial effluent, storm water runoff, or grey-water treatment. Since the 1950s, constructed wetlands have evolved into a reliable wastewater treatment technology for various types of wastewater. This policy brief urges the proposed G20 Working Group to propagate NbSs in treating wastewater, particularly in developing countries, before it is discharged into coastal and marine ecosystems.

Lovelock and Duarte (2019) define BC as all organic matter captured by marine organisms. This accounts for 83% of global carbon that is circulated through the ocean and accounts for 50% of the total carbon sequestered in ocean sediments (Blue Carbon Initiative, 2019). The conservation and management of marine ecosystems in order to reduce greenhouse gas emissions and thereby mitigate climate change is an international responsibility. This policy brief recommends that the G20 supports national policy change regarding coastal and marine management for long-term conservation of the world's BC ecosystems. In-country capacity strengthening of communities, projects for conserving BC ecosystems, incentives and regulation, financing models, and economic impact assessment tools will enable a worldwide BC economy. Other suggested policy initiatives for governments are: preparing integrated coastal plans and management of BC ecosystems; building on existing initiatives such as the REDD+ program (Reducing Emissions from Degradation and Deforestation of Forests), which is a program funded by the World Bank for developing and least developing countries under the UNFCCC; and forging public-private initiatives to accelerate the protection and restoration of BC ecosystems from pollution and other anthropogenic activities.

Proposal III

Integrate ocean and whales' valuation into climate risk mitigation and adaptation, mobilize blue carbon finance, investments, and economic valuation to conserve and value marine ecosystems

It is estimated that mangroves reduce annual flooding for more than 18 million people. Without mangroves, 39% more people would experience floods annually, and flood damages would increase by more than 16% and US\$82 billion annually (Losada 2018). Mangroves and seagrasses provide a per hectare ecosystem service of US\$91,000 around US\$12,000 respectively (Macreadie et al. 2019).

Apart from mangroves and ecology-based carbon sequestration, valuing and protecting whales can emerge in the climate agenda; one great whale is worth an estimated \$2 million when considering the value of carbon sequestered over the whale's lifetime (Figure 2). This includes its contribution to primary production and its economic contributions to the fishery industry and ecotourism (Chami et al. 2019). Whales are natural carbon-capture and sequestration creatures that absorb an average of 33 tons of CO₂ each throughout their lives, which is the equivalent of thousands of trees (Pershing et al. 2010). Whales also play an important role in enhancing primary production, significantly adding to the productivity of phytoplankton (Lavery et al. 2010; Roman et al. 2014). The latter is thought to capture over 37 gigatons of CO₂ per year, equivalent to the CO₂ captured by four Amazon forests per year.

In the pre-whaling era, it is estimated that 4–5 million whales existed; this has now reduced to approximately 1 million (Smith, Roman and Nation 2019), which implies that conserving whales can lead to higher carbon sequestration. The global community should support putting a price on killing whales (Eilperin 2012) and activate the moratorium on whaling, which is still being practiced commercially by Norway and Iceland (IWC n.d.). Commercial whaling was banned in 1986 under the IWC's moratorium, yet, 31,984 have been killed by whaling, according to the WWF website. Iceland and Norway lodged official objections to the moratorium and have continued commercial hunts. Japan and Iceland have also continued to hunt whales under the guise of “scientific whaling.” The scientific value in scientific whaling remains intensely debatable (Côté and Favaro 2016). This policy brief urges the proposed G20 Working Group to review and embrace the value of whales and enact initiatives to protect and restore whale population.

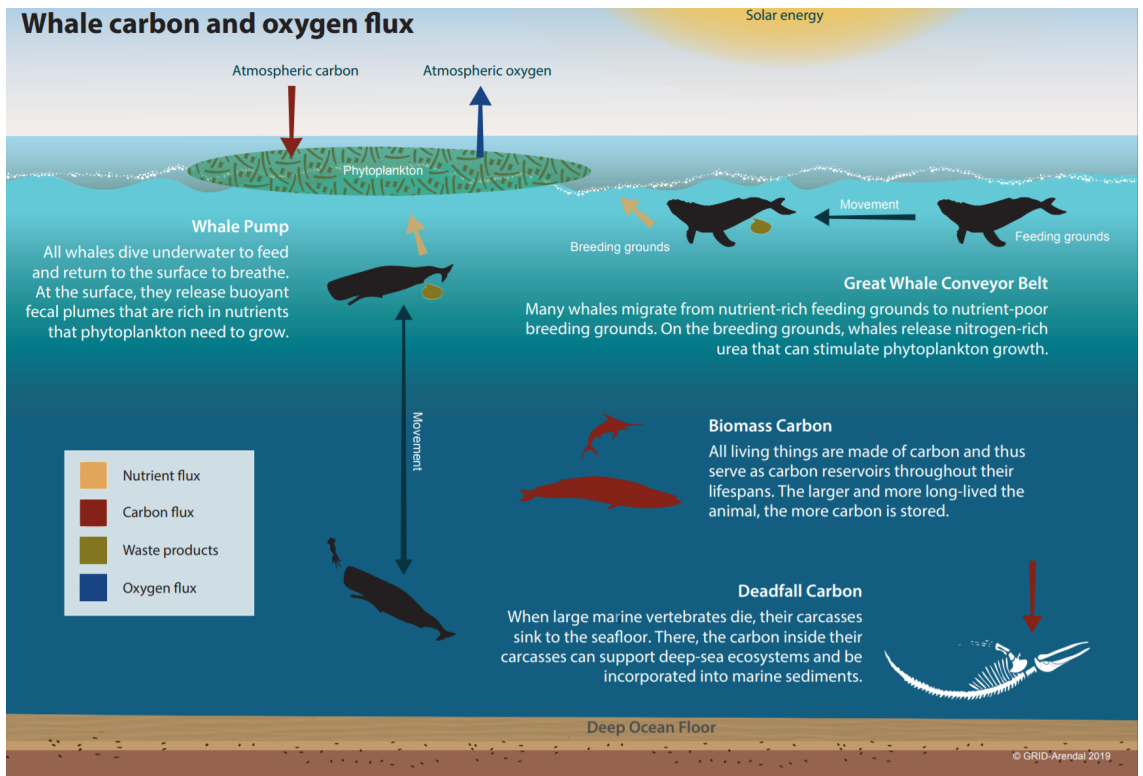


Figure 2: Whale carbon and oxygen flux.

Source: (Chami et al. 2019)

According to Beaudoin and Pendleton (2012), BC is the carbon captured and stored in coastal habitats like mangroves, seagrasses and salt marshes. Socioeconomics and governance assessments of coastal communities near 17 marine managed areas in Belize showed higher than average diverse income, which is the evidence needed to seek funds for MPAs. Shoreline protection is another ecosystem function that can be valued. Assigning an economic value to the carbon stored within coastal habitats allows individuals and governments to compare that value to the value of development; it is therefore possible for investment in conserving these ecosystems to be a way of offsetting carbon emissions.

Hence, the G20 can initiate in-country and international scientific valuation of ecosystem services provided by salt marshes, mud flats, mangroves, corals, seagrasses, marine creatures, and ecosystems to finance their conservation through the technical Working Group. Valuing ecosystems that are in the high seas must be treated as common assets and require international funds. This policy brief presents solutions to mitigate climate change by restoring degraded marine and coastal ecosystems, valuing them, and including them in the global carbon budget by quantifying GHG benefits at the UNFCCC platform. A dedicated research fund for universities to develop curriculum and conduct research on the blue economy would galvanize all economies. The Blue Bond approach and an international Blue Carbon Fund must be tabled by the proposed technical G20 Working Group. These economic initiatives can speed up the mobilization of investment for protecting coastal ecosystems.

The above recommendations are further strengthened by the UNESCO-declared decade of Ocean Science and Sustainable Development (2021–30). In light of the COVID-19 pandemic, ecosystem conservation becomes a global responsibility. The G20 must therefore play a substantial role in ocean health and biodiversity conservation.

Key Recommendations

1. Providing stewardship for ocean science, knowledge and technology by committing to creating a stand-alone **G20 Working Group on Blue Carbon Economy** that will exchange scientific input with member countries, technical institutions, the UNFCCC, the Convention on Biological Diversity (CBD), and UN's SDG Knowledge Platform among other forums by forging partnerships, bringing together countries, and developing a scientific evidence base.
2. **Strengthening the role of CBD and the ratified Aichi targets, SDG 14, and regional conventions** in implementation of NbSs, EbA, and BC through **country level policy actions** and funding, using established institutions like government Ministries.
3. **Operationalizing and prioritizing actions to monitor and regulate MPAs effectively** and add entirely new areas under protection that have scientific, regional and international significance by supporting international initiatives of institutions like IUCN and creating impetus for more binding international instruments.
4. **Mainstreaming the importance of EbA** under NbSs for coastal and marine ecosystem conservation in climate change mitigation at UNFCCC's Adaptation Committee. Integrating NbSs in country level NDCs to enhance climate mitigation and adaptation.
5. **Mainstreaming economic valuation of blue carbon** in the international carbon budget at UNFCCC and enhancing the scientific knowledge base on this through a research fund, to assign an economic value to carbon stored in coastal and marine ecosystems, which will enable their conservation. Creating mechanisms for the valuation for BC such as like Blue Bonds in member countries and internationally by creating a Blue Carbon Fund at the UNFCCC.

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Disclaimer

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