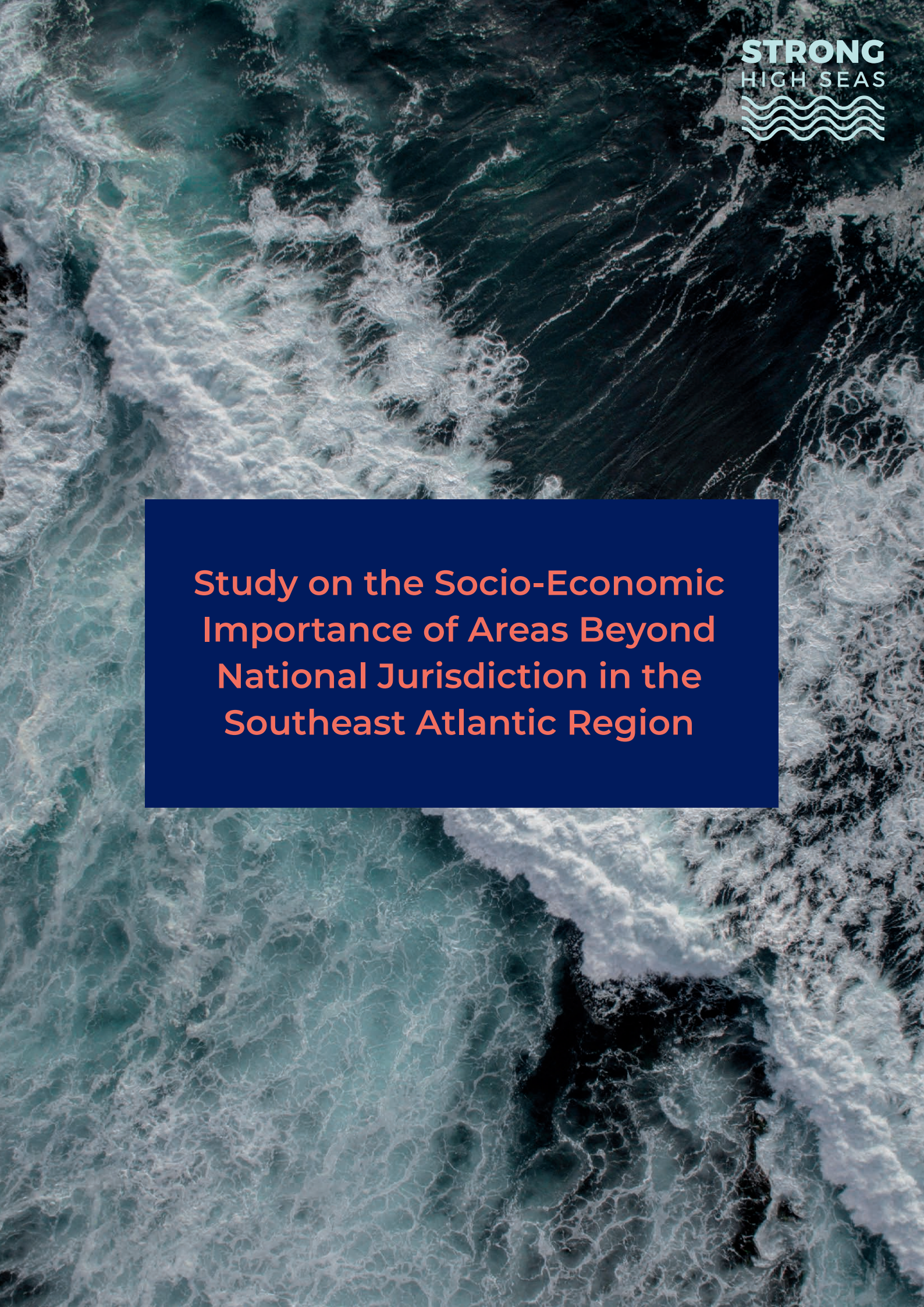

STRONG HIGH SEAS

Study on the Socio-Economic Importance of Areas Beyond National Jurisdiction in the Southeast Atlantic Region

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Abbreviations

ABMTs	Area-based Management Tools
ABNJ	Areas Beyond National Jurisdiction
ACBF	African Capacity Building Foundation
AFDB	African Development Bank
AIS	Automated Identification System
APEIs	Areas of Particular Environmental Interests
AU	African Union
BBNJ	Biodiversity Beyond National Jurisdiction
BMU	German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety
CAMAS	South Atlantic Maritime Area Coordination
CBD	Convention on Biological Diversity
CCZ	Clarion Clipperton Zone
COMRA	China Ocean Mineral Resources Research and Development Association
CPPS	Secretariat of the Permanent Commission for the South Pacific
EBSAs	Ecologically or Biologically Significant Marine Area
ECOWAS	Economic Community of West African States
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
EU	European Union
FAO	Food and Agriculture Organization
GDP	Gross Domestic Product
GFW	Global Fishing Watch
GNI	Gross National Income
IEA	International Energy Agency
ICCAT	International Commission for the Conservation of Atlantic Tunas
IGO	Intergovernmental Organization
IKI	International Climate Initiative
IMO	International Maritime Organization
IOC	Intergovernmental Oceanographic Commission
ISA	International Seabed Authority
IUCN	International Union for Conservation of Nature
IUU	Illegal, Unreported and Unregulated
LDCs	Least Developed Countries
MCS	Monitoring, Control and Surveillance
MGR	Marine Genetic Resources
MPA	Marine Protected Areas
MSP	Marine Spatial Planning
MTT	Marine Technology Transfer
NGO	Non-governmental Organization
OBIS	Ocean Biogeographic Information System
OECD	Organization for Economic Co-operation and Development
OIF	International Organisation of La Francophonie
PPPs	Public-private partnerships
REMP	Regional Environmental Management Plans

RFMOs	Regional Fisheries Management Organizations
SDGs	Sustainable Development Goals
SEAFO	South East Atlantic Fisheries Organization
SIDS	Small Island Developing States
TEUs	Twenty-foot equivalent units
TEV	Total economic value
UEMOA	West African Economic and Monetary Union
UN	United Nations
UNCLOS	United Nations Convention on the Law of the Sea
UNFCCC	United Nations Framework Convention on Climate Change
WAMER	West Africa Marine Ecoregion
WWF	World Wide Fund for Nature
ZOPACAS	South Atlantic Peace and Cooperation Zone

Executive summary

This report – *Study on the socio-economic importance of areas beyond national jurisdiction (ABNJ) in the Southeast Atlantic region* – aims to analyse the socio-economic importance of the ABNJ adjacent to the countries within the Abidjan Convention Area in West, Central and Southern Africa. It characterizes the socio-economic interests in ABNJ, underpinned by the ecosystem services concept, and the actual and potential social and economic outcomes (costs and benefits) associated with the conservation and use (exploitation) of marine resources, both in qualitative, and to the extent possible in quantitative terms. In this study, the term "socio-economics" is taken in a broad context to include the social aspects related to human well-being, livelihoods, impacts on communities, equity, socio-political systems, as well as economic ones. The analysis is based on an extensive literature review of scientific publications, articles, analysis of available data, stakeholder knowledge and experience, as well as expert opinion gathered through targeted interviews. It provides a narrative and forward-looking assessment of the key activities. The information presented is intended to support decision-makers, including government officials, the private sector and other stakeholders to make informed decisions about ABNJ and weigh environmental, social and economic objectives, in the context of a new internationally binding treaty for the conservation and sustainable use of marine biological diversity beyond national jurisdiction, the BBNJ agreement. This report is part of a series of reports covering issues of ocean governance with a focus on the Southeast Atlantic (and Southeast Pacific) published under the STRONG High Seas project – *Strengthening Regional Ocean Governance for the High Seas* (June 2017 – May 2022).

The characterization of socio-economic activities shows that currently, the primary activities in study region include fishing, navigation and transport, submarine cables and maritime security. Emerging activities include the harvesting and exploitation of Marine Genetic Resources (MGRs) and deep-sea mining. The collected information is used to support the development of 10 case studies – narrative, qualitative recounts, underpinned by quantitative findings when possible, of the social and economic outcomes of specific topics of key relevance to the study region. Each case study provides an overview of the identified benefits and costs, highlighting the main beneficiaries from the different activities, and what the primary costs (including monetary/non-monetary, direct/indirect, short/long-term) are.

General messages from the report:

- ↗ Activities in ABNJ require high up-front investment and operating costs, due to the long distances required to reach resources in ABNJ (e.g. fisheries), the long timeframes required to create profits (e.g. MGRs), and the advanced technologies needed to exploit materials (e.g. deep-sea mining and MGRs). These costs are often reduced through State subsidies and investments from public universities, research institutes or private industry, as well as reduced social standards for workers.

- ↗ The exploitation of common resources within ABNJ across all industries is dominated by a limited number of States and/or companies, including from Europe, as well as the United States, China, Taiwan and Japan. The result is that the socio-economic benefits resulting from the activities in ABNJ remain concentrated in a limited number of actors, while the costs due to reduced ocean health and ecosystem services is borne by the global community. These costs may be 'hidden' as they are distributed across all humans on the planet, but especially those living adjacent to ABNJ, such as in the study region, and include e.g. reduced contribution to global climate mitigation, forgone fishing opportunities, and loss of jobs and other contributions to local livelihoods.

- A number of blue economy activities are viewed as promising sources of development for the region, but if not well managed, these activities may increase the pressure on ecosystems and could negatively impact local communities, rather than supporting sustainable growth and social inclusion. Investments are needed to improve capacity, particularly in port infrastructure and the tourism sector. There is also a need to increase awareness on the sustainable blue economy – in the context of development policy and the green economy.

- Future and long-term benefits of maintaining biological resources are often discounted from market value, and accounts are given to current or short-term cost of conservation. In the long-term, the lack of consideration for the effects of economic activity on habitats and ecosystem services may create costs which may exceed by far the short-term economic benefits of unsustainable exploitation and use.

- This study was conducted in the second half of 2020, at the same time as the COVID-19 global pandemic. Although the COVID-19 crisis had (and will continue to have) unprecedented impacts on most sectors, including relevant blue economy sectors, and on the socio-economics of most countries, including the countries in the study region, these impacts could not be fully documented in this report as relevant data is still emerging. Nevertheless, COVID-19 presents an opportunity for a sustainable and equitable Blue Recovery, capitalizing on the role of ocean-based solutions and fast-tracking towards a more sustainable blue economy.

- Clear interdependencies exist between the socio-economic Sustainable Development Goals (SDGs), including but not limited to SDG 1, 2, 3, 4, 5, 8 and 10 (respectively: reduce poverty, zero hunger, good health and well-being, quality education, gender equality, decent work and economic growth and reduced inequalities), and the achievement of the environment-related ones, notably SDG 14 "Conserve and sustainably use the oceans, seas and marine resources for sustainable development". The analysis of these links shows that biodiversity, both within and beyond national jurisdiction, needs to be taken into account when acting to achieve SDGs.

- The Biodiversity Beyond National Jurisdiction (BBNJ) agreement has the potential to facilitate capacity building, knowledge transfer, research and cooperation and thereby support a more comprehensive understanding of topics related to ABNJ by stakeholders in the study region. However, States and stakeholders must also take an active role, participating in relevant discussions (BBNJ negotiations) in order to ensure their views are represented and considered in the BBNJ agreement.

- The BBNJ agreement presents a unique opportunity for collective action towards the conservation and sustainable use of marine biodiversity and natural resources in ABNJ and has the potential to boost coordination and cooperation across global, regional and sectoral organizations. Cross-sectoral management measures will be required to address the interdependencies between socio-economic interests, including in ecosystem services, in ABNJ and the cumulative pressures resulting from these activities.

The following points summarize the key findings for each of the 10 case studies:

1. Most countries in the study region currently have **limited capacity to access and explore ABNJ** adjacent to their territorial waters or beyond. In general, ABNJ are considered "out of reach" and inaccessible;

2. Declining fish stocks in territorial waters, including the exclusive economic zone (EEZ), means many fisheries are moving their activities further offshore. **Yet, most countries in the study region do not have the required capacity and investment means (vessels, fuel, and equipment) to operate in ABNJ.** Five of the 22 countries in the study region are active in ABNJ, generating 1.2 % of the global revenues from ABNJ fisheries. **Fish resources from the adjacent ABNJ are mainly caught by Europe-**

an (France, Spain) and Asian (Japan, Taiwan) vessels, which heavily rely on subsidies to sustain an otherwise non-profitable economic activity (see case studies 1 and 4);

3. **Low wages, non-compliance with labour and safety standards, poor working conditions, and the use of forced or slave labour are amongst ways to reduce operating costs and increase profits of fishing in ABNJ.** These human rights abuses are often linked to organized crime, including human trafficking for forced labour, drug and arms trafficking, smuggling of humans and fuel, money laundering, corruption and piracy;

4. **Illegal, Unreported and Unregulated (IUU) fishing** is a critical issue that affects fisheries in the study region and one of the greatest threats to marine ecosystems. IUU fishing causes disproportionate socio-economic impacts on small-scale fishers and coastal livelihoods that depend on them, as well as on the wider economy, as illustrated by the case of "saiko" (see case studies 2 and 3);

5. Practices that lead to **overfishing associated with the loss of biodiversity** reduces the ecosystem's ability to provide goods and services, which in turn leads to the loss of socio-economic benefits and affects human well-being, particularly food security and nutrition (see case studies 5 and 6). This increases the interest of some countries in the region to conserve ABNJ;

6. **Market distortions on the value of biological resources** lead to overfishing and critical consequences to ecosystem functioning (see case study 6);

7. The current **lack of supporting evidence on the nature and scale of the commercial value in MGR** means that the commercial potential of MGR from ABNJ is largely still speculative. The potential for **commercialization of MGR is in the hands of a few "keystone actors" from the world's most highly industrialized countries.** Stakeholders interviewed in the study region aspire to the prospects of generating **monetary, as well as important non-monetary benefits** through increased collaboration on marine scientific research, access to data and information, and transfer of knowledge, capacities and marine technologies (see case study 7);

8. When it comes to deep-sea mining there is little activity within the study region, while exploration operations are advancing in other areas of the world. **Though the scientific understanding of the extent of environmental risks is limited, existing studies indicate that deep-sea mining is expected to cause significant impacts on the marine environment in the form of destruction and degradation of deep seabed ecosystems, ecological disturbance and biodiversity loss, and alteration of adjacent ecosystems. These impacts would in turn result in high costs for society due to reduced ecosystem services.** Many countries in the study region exploit land mining operations, meaning deep-sea mining could be a source of competition with the potential to impact their economies. Engaging in deep-sea mining for countries in the study region would require significant up-front investments in technology, equipment and capacities (see case study 8 and 9);

9. The implications of the **connectivity between activities in ABNJ and the adjacent EEZs** are not only oceanographic and ecological, but also socio-economical with evidence that coastal livelihoods can be severely impacted by ABNJ activities. For this reason, discussions on the management of ABNJ are complementary to the mandate and actions under the Abidjan Convention (see case study 10);

10. Despite the current low levels of activities in the study region, **the discussion on the management of ABNJ, including those topics that are still emerging in the study region, is timely** as it allows the countries to identify the future needs and challenges to be able to balance conservation and sustainable exploitation.

1. Introduction

Oceans play a key role in sustaining life on Earth and provide vital ecosystem services such as provisioning, supporting, regulating and cultural services. Home to valuable species, rich and rare marine biodiversity, areas beyond national jurisdiction (ABNJ) account for more than 64% of the ocean and almost 50% of the planet's surface. The interest in using ocean space and its resources goes beyond States' exclusive economic zones (EEZ) into ABNJ. The use and protection of marine resources bring significant contributions to societies, their economies and welfare of citizens, marked by a strong interdependence between healthy oceans and human well-being.

1.1 Context

The overarching objective of this assessment is to analyse the socio-economic importance of the ABNJ adjacent to the territorial waters[1] of the States party to the Abidjan Convention[2]. It aims to characterize and assess the actual and potential social and economic outcomes – costs and benefits - associated with the conservation and use (exploitation) of marine resources, both in qualitative and, wherever possible, quantitative terms.

An urgent need to increase the knowledge on the ABNJ in the study region (e.g. through enhancing monitoring and observations infrastructure, enhancing understanding of ecological connectivity, etc.) was identified by the countries of the Abidjan Convention region, claiming that as it is a relatively new topic, many stakeholders are generally not aware of issues and topics related to ABNJ. Region-specific studies that highlight the socio-economic importance of conserving and sustainably using ABNJ are, however, generally lacking.

In this study, the term "socio-economics" is used in a broad context to include the social aspects related to human well-being[3], livelihoods, impacts on communities, equity, socio-political systems, as well as economic ones. Such information is intended to support decision-makers, including government officials, the private sector and other stakeholders to take informed decisions that will allow for the optimization of environmental, social and economic benefits from ABNJ in the context of a new international legally-binding instrument for the conservation and sustainable use of marine biological diversity beyond national jurisdiction, the BBNJ agreement (see Box 1).

This report is based on a literature review of scientific publications, articles, analysis of available data, stakeholder knowledge and experience, as well as expert opinion gathered through targeted interviews. To the extent possible, the analysis is based on available economic and social indicators that describe the importance of the marine activities to the economy or the direct economic value from the use of the marine environment to beneficiaries, supplemented by examples/case studies. It is part of a series of re-

[1] In this report, the term 'territorial waters' is used informally to refer to any area of water over which a state has jurisdiction, including internal waters, the territorial sea, the contiguous zone, the exclusive economic zone and potentially the continental shelf.

[2] The official country names (followed by short forms in brackets) by the United Nations are: Republic of Angola (Angola); Republic of Benin (Benin); Republic of Cameroon (Cameroon); Republic of Cape Verde (Cape Verde)*; Democratic Republic of Congo; Republic of Congo (Congo); Republic of Côte d'Ivoire (Côte d'Ivoire /Ivory Coast); Republic of Equatorial Guinea (Equatorial Guinea)*, Gabonese Republic (Gabon); Republic of The Gambia (The Gambia); Republic of Ghana (Ghana); Republic of Guinea (Guinea-Conakry), Republic of Guinea-Bissau (Guinea-Bissau), Republic of Liberia (Liberia); Islamic Republic of Mauritania (Mauritania); Republic of Namibia (Namibia); Federal Republic of Nigeria (Nigeria); Democratic Republic of São Tomé and Príncipe (Sao Tome e Principe)*; Republic of Senegal (Senegal); Republic of Sierra Leone (Sierra Leone), Republic of South Africa (South Africa) and Togolese Republic (Togo). * have not ratified Abidjan Convention. For the sake of brevity, only the short forms are used in the text.

[3] Human well-being is a complex concept that embraces: utility (happiness, desire fulfillment, and preference), material well-being (most notably, income and resources), and "list-orientated" views (needs, rights, and capabilities) (Clark, 2014).

ports covering issues of ocean governance with a focus on the Southeast Atlantic (and Southeast Pacific) published under the STRONG High Seas project. The study region includes the ABNJ in the Southeast Atlantic region, loosely defined here as the Eastern side of the South Atlantic Ocean, between Mauritania and South Africa (Figure 1). ABNJ include the water column (the high seas) and the seabed (the Area) outside of the EEZ of coastal states. For the purpose of this report, we generally refer to the term ABNJ, although 'high seas' may be used when citing directly from existing publications that use that specific terminology, and 'territorial waters' to refer to areas comprising national waters or the EEZ.

Figure 1: Map showing the study region. Source: Boteler et al. (2019)

After this introductory chapter, Chapter 2 – *Socio-economic status of countries adjacent to the study region* – provides a brief overview highlighting the key socio-economic indicators of the adjacent countries, with the aim to set the context for the analysis in subsequent chapters. Chapter 3 – *Characterization of socio-economic interests in ABNJ* – underpinned by the ecosystem services concept, provides a description of the provisioning, supporting, regulatory and maintenance, cultural and other services supplied by marine ecosystems in ABNJ. This paves the way to Chapter 4 – *Characterization of the socio-economic importance of ABNJ*, the core of the assessment that describes how changes to human activities and the associated changes in marine biological diversity create socio-economic outcomes (costs and benefits) across States and societal groups. This chapter also describes the benefits provided by ecosystem services as a function of the state of marine biodiversity and explores the socio-economic impacts of marine degradation. Finally, the key findings and conclusions are presented in Chapter 5 – *Key findings and outlook*.

Box 1: Towards a new agreement for the conservation and sustainable use of marine biological diversity beyond national jurisdiction (BBNJ)

At the global level, a new international legally-binding instrument under the United Nations Convention on the Law of Sea (UNCLOS) for the conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction (BBNJ) is being negotiated (UN Resolution 69/292; UN Resolution 72/249). UNCLOS is the fundamental international legal agreement, which provides the framework for States to allocate coastal and maritime boundaries and identifies what remains as global commons. Nested as an implementing

instrument under UNCLOS, the BBNJ agreement is expected to create opportunities for better harmonization and synergies across legal and institutional frameworks and to provide mechanisms for enhanced coordination and cooperation among the various users and beneficiaries of ocean biological resources. It is expected to fill a gap in the current complex and fragmented global ocean governance framework, shared between regional fisheries management organizations, UN and non-UN hosted Regional Seas Programmes, the International Seabed Authority (ISA) and some other bodies or frameworks. Other relevant conventions include multilateral and bilateral agreements, such as the Convention on International Trade in Endangered Species, regional and species-specific instruments related to the Convention on Migratory Species, regulations addressing marine pollution from land-based sources and from ships under the International Maritime Organization (IMO) conventions, and agreements addressing maritime boundaries, deep-sea cables, and ocean navigation rules (see Durussel et al. (2018) for a fully comprehensive institutional overview). The BBNJ agreement negotiations are structured around four "package" elements: marine genetic resources (MGR) including questions on the sharing of benefits, area-based management tools (ABMTs), including marine protected areas (MPAs), environmental impact assessments (EIAs), and capacity building (CB) and marine technology transfer (MTT).

It is envisaged that once in place, the BBNJ agreement will enable the conservation and sustainable use of marine biodiversity, which contributes towards the fight against climate change and human inequality, secure food sources and consequently livelihoods. Tiller et al. (2019) described how the "dichotomy between common heritage of mankind and freedom of the seas" (the 'common heritage of mankind' principle that underpins the rules on seabed mining and the structure and mandate of the ISA; the 'freedom of the high seas' principle that ensures access to high seas navigation, fishing, and laying of seafloor cables) was a central issue in the BBNJ negotiations and the cause of segmentation between the vulnerable developing and influential developed countries during the negotiations. Diverging interests in environmental protection and the sustainable management of the oceans are at odds with the economic exploitation of living and non-living marine resources, fueled by the politicization of science in an area characterized by uncertainty and incomplete scientific knowledge. Treaty negotiations started in 2018 but have been postponed in 2020 in the face of the global crisis caused by COVID-19.

Sources: Durussel et al. (2018), Tiller et al. (2019)

The analysis of the socio-economic impacts (costs and benefits) is guided by the assessment framework presented in Figure 2, depicting the link between A. human activities, B. pressures, C. state of biodiversity and D. protection and management measures at its core. The arrow from state of C. biodiversity to A. human activities describes the two-way effect that the state of marine ecosystems has on human activities, i.e. the economic sustainability of an activity is dependent on the state of biodiversity; yet at the same time it exerts pressure on the same ecosystem.

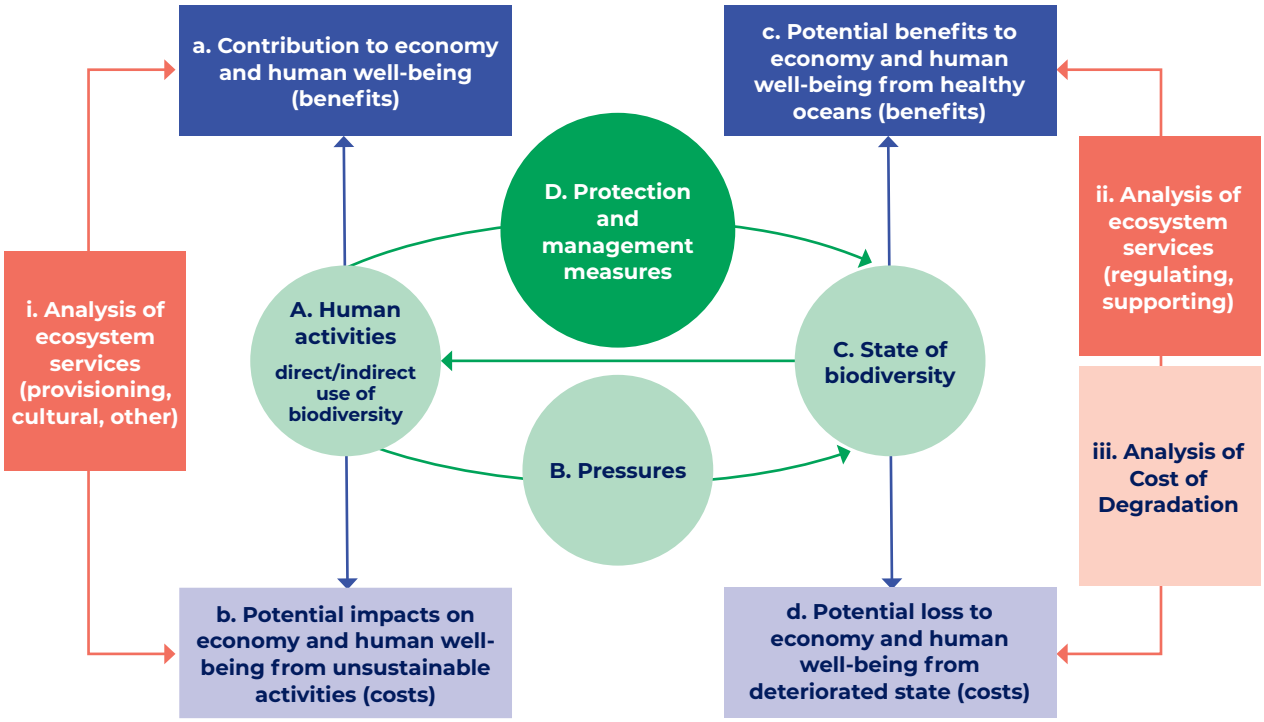


Figure 2: Assessment framework for the socio-economic analysis of human activities in ABNJ. Source: Elaborated from HELCOM (2018)

A distinction is made between the direct contribution of human activities to the economy and human well-being (a. benefits), as opposed to potential impacts from unsustainable activities (b. costs), e.g. impacts on human well-being due to violation of labour rights. By changing the state of C. biodiversity, A. human activities generate c. benefits and d. costs indirectly. Through D. protection and management efforts, the C. state of the marine biodiversity can be maintained or improved, securing the ecosystem services they provide. Healthy oceans benefit both human well-being and economies. In this report, the analysis of the socio-economic interests in ABNJ presented is structured along the ecosystem services approach (i. and ii.). On the other hand, the degradation of marine biodiversity reduces the ecosystem's ability to produce goods and services, which in turn leads to the loss of economic benefits and affects human well-being, the so-called cost of degradation (iii.).

1.2 About STRONG High Seas

STRONG High Seas – *Strengthening Regional Ocean Governance for the High Seas* – is a five-year (June 2017 – May 2022) research project focusing on strengthening ocean governance in the Southeast Pacific and Southeast Atlantic. Working with the Secretariat of the Permanent Commission for the South Pacific (CPPS) and the Secretariat of the West and Central Africa Regional Seas Programme (Abidjan Convention), the project will develop and propose targeted measures to support the coordinated development of integrated and ecosystem-based management approaches for ocean governance in ABNJ. States in these regions recognize the need to conserve and sustainably use marine biodiversity, including in ABNJ, and are working through these regional organizations to achieve this goal. The STRONG High Seas project is funded through the International Climate Initiative

(IKI). The German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) supports this initiative on the basis of a decision adopted by the German Bundestag.

1.3 Sustainable blue economy in ABNJ

Throughout the BBNJ negotiation process, the management issues of ABNJ have gained prominence, prompting global discussions on the access and benefits-sharing of resources. These discussions are closely linked to the discourse on sustainable and equitable blue economy (e.g. Bennett et al. 2019; see Box 2), advocating for environmentally sustainable and socially equitable use of ocean space. According to The World Bank (2019), the blue economy refers to the development of oceanic economic activities in an integrated and sustainable way. It is focused on capturing potential synergies and managing the trade-offs across industries to better address the growing threats now confronting oceans, and particularly those posed by climate change. A blue economy strives to maximize the socio-economic benefits generated by oceanic activities, including food production and job creation.

Box 2: The blue economy: concepts and facts

The origins of the blue economy concept can be traced back to the 2012 UN Rio+ conference and the report on 'Green Economy in a Blue World'. Building on a growing global consensus on the socio-economic relevance of the concept and its related activities, the term ocean economy was more recently adopted by international bodies, such as the Organization for Economic Co-operation and Development (OECD), United Nations (UN) and World Bank. The term ocean economy often implies a focus on both 'fresh water' and 'inland-water' as essential dimensions of the sector – especially when assessing the financing of sustainable blue economy in developing and emerging economies globally. The blue economy definition recognizes the relevance of some more 'traditionally' established economic activities, such as extraction and commercialization of marine living resources, shipping and maritime transport, ports activities, shipbuilding and repairs, coastal and maritime coastal tourism, etc. Further, the definition also encompasses a number of emerging but equally relevant innovative activities, such as maritime energy (offshore wind and ocean energy), blue biotechnology, desalination, etc.

Similar to the 'Green Economy', the blue economy model aims for improvement of human well-being and social equity, while significantly reducing environmental risks and ecological scarcities. It provides for an inclusive model in which coastal states - which sometimes lack the capacity to manage their rich ocean resources - can begin to extend the benefit of those resources to all.

Some key facts:

- ↗ The worldwide ocean economy is valued at around US$ 1.5 trillion per year;
- ↗ 90 % of global trade by volume is carried by sea;
- ↗ 350 million jobs worldwide are linked to fisheries;
- ↗ By 2025 it is estimated that 34 % of crude oil production will come from offshore fields; and
- ↗ Aquaculture is the fastest growing food sector and provides about 50 % of fish for human consumption.

Sources: OECD (2016), Commonwealth Secretariat (2021)

Box 2: The blue economy: concepts and facts – cont.

Focusing on Africa:

More than one-quarter of Africa's population lives within 100km of the coast and derive their livelihoods there. According to the International Energy Agency (IEA), by 2020, the annual economic value of energy activities related to maritime affairs may reach US$ 3 billion (~EUR 2.5 billion). Out of the 54 African countries, 34 are coastal countries and over 90% of African exports and imports are transported by sea. The territorial waters under African jurisdiction cover a surface area of 13 million km², with a continental shelf of some 6.5 million km² comprising the EEZ. The continent covers 17% of the world's surface water resources. According to a FAO study, the total gross added value of the fisheries and aquaculture sector in Africa is estimated at US$ 24 billion, i.e. 1.6% of the GDP of all African countries. According to FAO, this sector employs some 12.3 million people. By some estimates, the African maritime industry is worth US$ 1 trillion annually.

The African Union proclaimed that the *"blue economy could become the new frontier of an African renaissance"*. In 2016, the African Union Assembly adopted a Charter on Maritime Security and Safety and Development in Africa, known as the "Lome Charter". Its objectives are to:

- Prevent and suppress national and transnational crime, including terrorism, piracy, armed robbery against ships, drug trafficking, smuggling of migrants, trafficking in persons and all other kinds of trafficking through the sea and illegal, unreported, and unregulated (IUU) fishing;
- Promote the environment in general and the marine environment in the space of coastal and insulate States, in particular;
- Promote a flourishing and sustainable Blue/Ocean economy;
- Boost the implementation of the 2050 Africa's Integrated Maritime Strategy in conformity with International Maritime Law; and
- Promote the training and capacity building of the maritime, port and industrial sector, for safe and responsible use of the maritime domain;

Following the Sustainable Blue Economy Conference that took place in Nairobi, Kenya in 2018, the Africa Blue Economy Strategy was launched. Its objective is to guide the development of an inclusive and sustainable blue economy that becomes a significant contributor to continental transformation and growth, through advancing knowledge on marine and aquatic biotechnology, environmental sustainability, the growth of an Africa-wide shipping industry, the development of sea, river and lake transport, the management of fishing activities on these aquatic spaces, and the exploitation and beneficiation of deep-sea minerals and other resources. The African Union has identified blue ocean economy development as a priority goal towards achieving the aspiration on *'A prosperous Africa based on inclusive growth and sustainable development'* within the context of the Africa Union Agenda 2063 – the blueprint and master plan for transforming Africa into the global powerhouse of the future.

Sources: African Union Commission (2015), AU-IBAR (2019)

Increased attention has been put on the environmental sustainability of the blue economy in recent years, yet the economic and financial aspects have remained the focal points. Although the blue economy features social equity and environmental sustainability as core tenets, the push for economic growth through ocean development is side-lining these tenets in policy and practice (Bennett et al., 2019). Social sustainability builds on the provision of equal opportunities, social stability and inclusive growth. It should provide quality employment and the improvement of livelihoods (Ecorys et al., 2020). In parallel, it is necessary to protect and/or preserve habitats and ecosystems, not only for the sake of sustaining economic activities but also for the ecosystem services they provide and their intrinsic value, as opposed to the economic value[4] (Rea and Munns Jr, 2017).

ABNJ are a shared "global commons" owned by all citizens. In reality being an "open-access" resource, ABNJ tend to be exploited by a few powerful economic actors, bringing inequitable and disproportionate benefits to just a small minority (EJF, 2020). The prospective new era of the blue economy has prompted haste to claim ocean space and resources. Terms such as "ocean grabbing"[5] (e.g. Bennett et al. 2015) and "elite capture"[6] are frequently used to describe the unregulated exploitation of marine resources, which leads to economic inequalities by generating limited local benefits, and exposing marginalized groups to damaging environmental, social and cultural impacts (Bennett et al., 2019). This is driven by the strong security and economic interest of various states and corporate actors in controlling or exploiting biodiversity in ABNJ, with the risk that less affluent nations who contributed least to the overexploitation of resources, will suffer most from this loss.

With the increase in human activities and exploitation of ABNJ, in part triggered by the recent push in innovation and technology that drives the exploration of previously inaccessible environments, the cumulative pressures and impacts present a serious risk to marine ecosystems. The pace of environmental degradation is significantly increasing in many parts of the world's ocean (Halpern et al., 2019). There is now sufficient evidence that pressures like overfishing, plastic pollution and climate change have resulted in systemic threats to marine biodiversity in ABNJ (Boteler et al., 2019), including pressures from emerging activities such as seabed mining, of which the risks are less-known but considered to be potentially substantial with far-reaching impacts.

ABNJ are intrinsically connected to coastal areas. This concept of "connectivity" encompasses both oceanographic connectivity -– the transportation of material, such as nutrients, small marine organisms and other particles, by ocean currents and processes, such as sinking and upwelling; and ecological connectivity – the geographical linking of individuals and populations throughout their migratory cycles (Popova et al., 2019). The degree of connectivity is not necessarily the result of "adjacency" – the spatial/geographical proximity of a state's maritime borders to open ocean ABNJ (Popova et al., 2019). The implications of connectivity are important in the management of ABNJ. In areas where the connectivity between ABNJ and coastal zones is strong, activities in the ABNJ can directly impact the well-being of coastal communities, e.g. impacts of fisheries in ABNJ could undermine management efforts in territorial waters. The opposite holds true, in that activities taking place in areas within national jurisdiction can create pressures (e.g. marine pollution, debris,

[4] The concept of intrinsic value reflects the perspective that nature has value in its own right, independent of human uses.

[5] Ocean grabbing thus means the capturing of control by powerful economic actors of crucial decision-making (e.g. around fisheries), including the power to decide how and for what purposes marine resources are used, conserved and managed now and in the future.

[6] Elite capture is a form of corruption whereby public resources are biased for the benefit of a few individuals of superior social status in detriment to the welfare of the larger population.

alien species) on ABNJ, creating a "connectivity corridor" along which life cycles of species and marine pollution do not adhere to administrative boundaries. These boundaries can change, not only due to migration but also to longer-term processes, such as climate change. Strong evidence exists for the value of connectivity in maintaining the integrity and functionality of ecosystems and services derived from them (Olds et al., 2016).

No single State or organization has the legal mandate for the protection of biodiversity in ABNJ, making it particularly vulnerable to human activities. However, some sector-specific organizations (e.g. International Maritime Organization (IMO), International Seabed Authority (ISA), Regional Fisheries Management Organizations (RFMOs)) have the legal mandate to manage specific human activities (e.g. shipping, mineral exploitation, fishing) which have an impact on marine biodiversity in ABNJ. This has called for the urgent need of an international legally-binding instrument for the conservation and sustainable use of marine biological diversity beyond national jurisdiction (BBNJ) (see Box 1); one that will be global and will address the direct management and conservation of biodiversity, including its genetic components.

1.4 Main limitations and gaps: Consequences for assessment

A common adage is that *"We know more about the surface of the Moon than we do about the bottom of the ocean"* (Paul V. R. Snelgrove, marine biologist). With more than 80 % of the ocean unmapped, unobserved, and unexplored, the characterization of vast ocean areas lacks quantitative data. Some data on specific activities, such as fisheries, is available. Others, including the exploitation of marine genetic resources (MGR), lack data and information on their potential value, whereas activities such as deep-sea mining are still emerging and therefore not yet fully deployed. In addition, the benefits of biological resources and threats to biodiversity often result from broad and complex chains of cause and consequence (De Santo et al., 2019). This greatly limits the capacity to conduct quantitative analyses and to apply standard cost and benefit analysis (CBA) methodologies that allow for the monetary quantification.

For this reason, the study mainly provides a narrative and forward-looking assessment on the key activities, based on literature review and available data (if any), supplemented by stakeholder knowledge. The collected information is used to support the development of storylines and case studies – narrative, qualitative recounts of social and economic outcomes.

2. Socio-economic status of countries adjacent to the study region

The ecological characteristics of the study region, including areas of special ecological importance, areas of geological importance, benthic and pelagic habitats, and marine biodiversity have been extensively described in Boteler et al. (2019). Although the ABNJ in the Southeast Atlantic is the geographical focus of this study, the analysis should be viewed within the context of the socio-economic status of the 22 adjacent coastal countries. This sizable number of countries have different cultures, languages and resources, as well as interests and needs, in terms of the conservation and sustainable use of BBNJ (Durussel et al., 2018). For this reason, a snapshot of the key socio-economic facts and figures, including population, income, education and occupation, of the countries adjacent to the study region is provided below. This chapter is not intended to give a full socio-economic analysis of the region but to highlight those aspects that are most important for the analysis and storylines presented in the next chapters.

The total population of the 22 coastal countries adjacent to the study region currently stands at 557 million (data for 2020; UN DESA, 2019), implying a near six-fold increase since 1950 (Figure 3). The increasing trajectory is likely to continue; projections indicate that the population will surpass one billion by 2050. As in other parts of the world, urbanization and industrialization are generally centred along the coastal area, resulting in dense coastal cities and populated deltas. Nearly 20 % of the total population consists of youths aged 15–24 (Figure 3), with projections indicating an increasing trend in the youth population in the coming decades (UN DESA, 2015). This poses further challenges to the region in educating and employing the young generations.

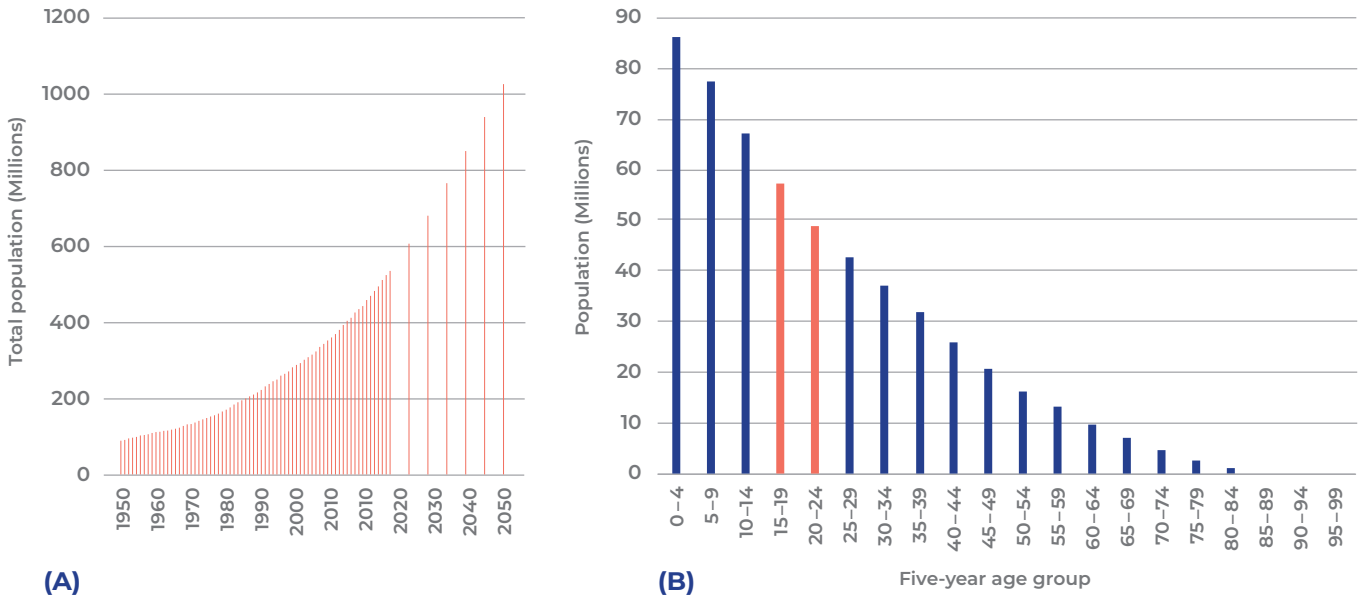


Figure 3: (A) Total population in the study region, including projected population for 2020–2050 (Millions); (B) Population in 2020 per age group (Millions) Source: UN DESA (2019)

The region faces substantial socio-economic and development challenges, as shown by both the Gross Domestic Product (GDP) per capita, the indicator of a nation's economic output and a good representation of a country's standard of living, and the Human Development Index (HDI) that measures key dimensions of human development[7] (Figure 4). This is in part due to the prominence of the informal sector, which is remarkably high in the region, exceeding 90 % of total non-agricultural employment in some countries (World Bank data[8] – not shown). However, it should be noted that while the normalization of GDP per capita provides a more comparable metric, it also gives consideration to the unparalleled population growth. In absolute terms, the region has witnessed an important overall increase in GDP (and Gross National Income – GNI) since around 2000 (not shown) thanks to the considerable efforts made by the countries with the development support from their partners, both countries (such as Brazil, China, India, France, Venezuela, USA and Germany[9]) and organizations or institutions (such as African Capacity Building Foundation (ACBF), African Development Bank (AFDB), African Union (AU), European Union (EU), International Organisation of La Francophonie (OIF)[10], West African Economic and Monetary Union (UEMOA)[11], United Nations Development Programme (UNDP) and United Nations (UN)) (ECOWAS, 2016). However, this progress is not able to keep up with the rapid population growth, which partly explains why 12 of the 22 countries are amongst the Least Developed Countries (LDC). In some countries of the region, the total unemployment rate greatly exceeds the global average of 5.4 %, exacerbated by the unemployment rates for youth reaching as high as 40 % (Figure 4). Youth unemployment today will decrease the incomes of future retirees, increasing the burden on the state and the chances of poverty in the future.

[7] The three key dimensions of the HDI are: 1. A long and healthy life – measured by life expectancy; 2. Access to education – measured by expected years of schooling of children at school-entry age and mean years of schooling of the adult population; 3. A decent standard of living – measured by GNI per capita adjusted for the price level of the country. Note that UNDP classifies each country into one of three development groups: a. Low human development for HDI scores between 0.0 and 0.5; b. Medium human development for HDI scores between 0.5 and 0.8; c. High human development for HDI scores between 0.8 and 1.0.

[8] https://data.worldbank.org/; Accessed in September 2020.

[9] The official country names (followed by short forms in brackets) are: Federative Republic of Brazil (Brazil); People's Republic of China (China); Republic of India (India); French Republic (France); Bolivarian Republic of Venezuela (Venezuela); United States of America (USA); Federal Republic of Germany (Germany). For the sake of brevity, only short forms are used in the text.

[10] Known under French acronym OIF that stands for: Organisation internationale de la Francophonie

[11] Known under French acronym UEMO that stands for: Union Economique et Monétaire Ouest Africaine

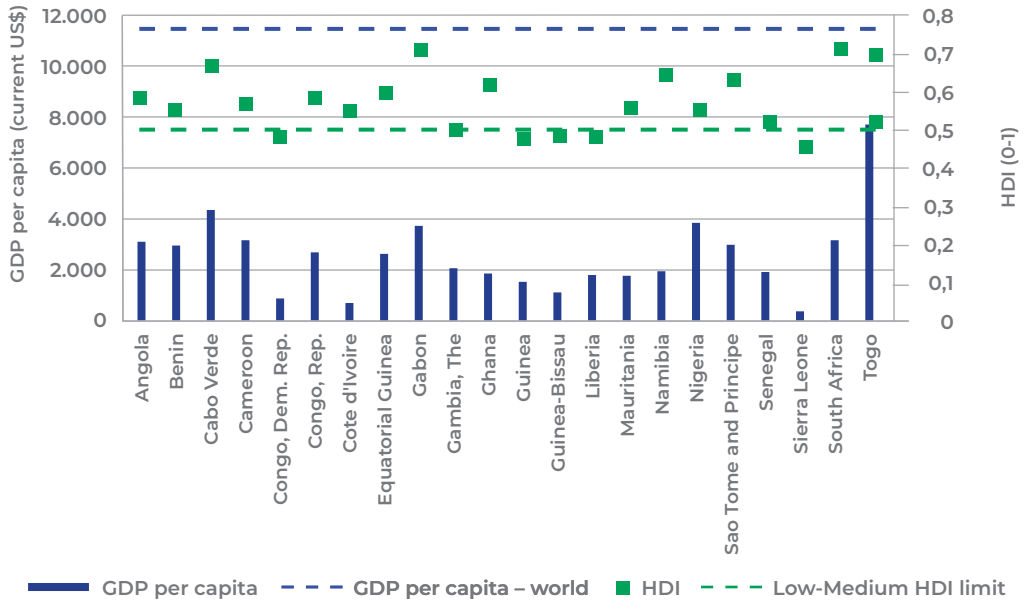
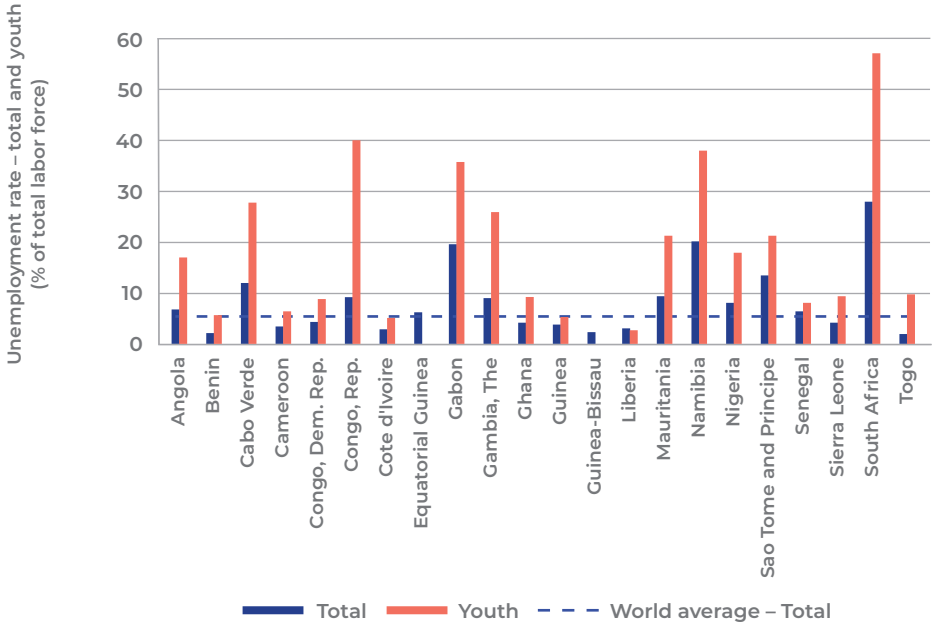


Figure 4: (A) GDP per capita (current US$) and HDI (0–1) | Data are for 2019. Sources: Data for GDP per capita are from World Bank – World Development Indicators (2020) | Data for HDI are from UNDP-Human Development Reports (2020)



(B) Total and youth (age 15–24) unemployment rate (%) | Data for total unemployment rate are for 2019. Data for youth unemployment rate are for the latest year available (see Annex for complete data set). Source: World Bank – World Development Indicators (2020)

Evidence shows strong associations between poverty and inequality; in some cases, inequality can itself act as a driver of poverty (Hills et al., 2019). The Gini index, often used as a gauge of economic inequality and a measure of income distribution, lies between 30–50% for most of the countries in the region. However, the national poverty headcount ratio – the percentage of the population living below the national poverty lines – varies between 17 and 77% (Figure 5).

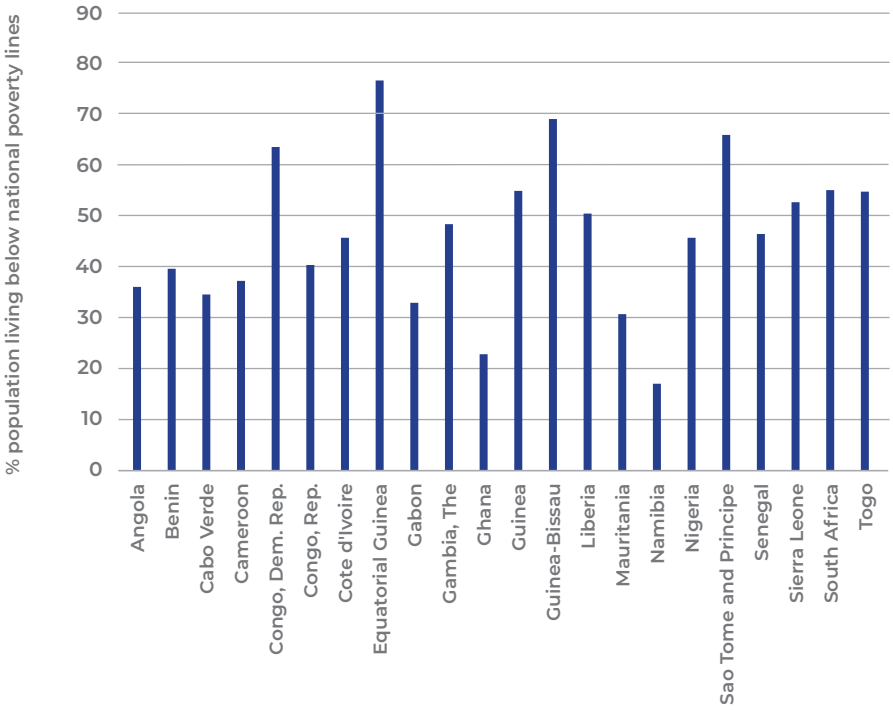
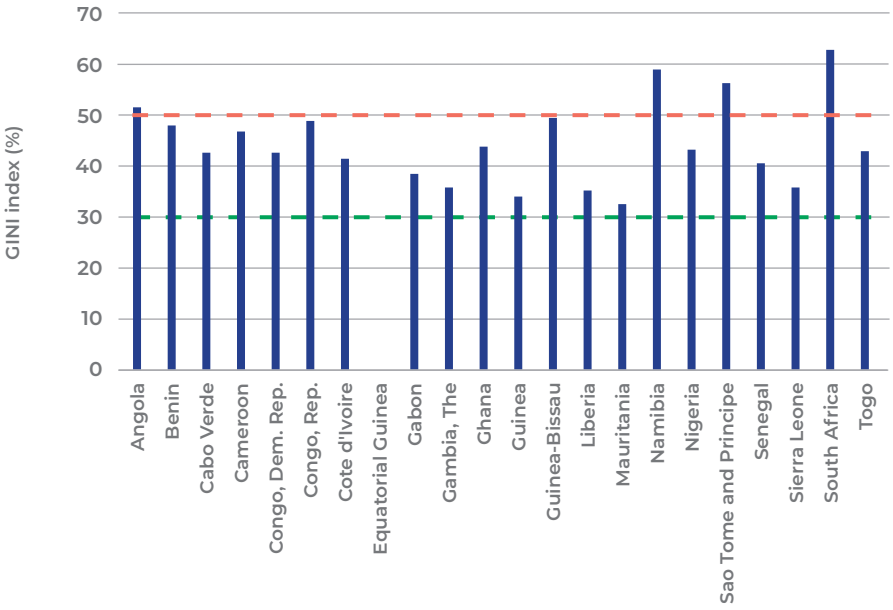


Figure 5: (A) % population living below national poverty lines | Data are for latest year available (see Annex for complete data set).



(B) Gini Index (%) | Data are for latest year available (see Annex for complete data set).
A Gini Index value < 30 % is considered low; 30<>50 is considered medium;
> 50 is considered high.
Source: World Bank – World Development Indicators (2020). The complete dataset is provided in the Annex.

Recent studies point towards the interconnectedness between poverty and environmental issues, entangled in a complex web of human-environment relationships (Rai, 2019) the so-called poverty-environment nexus (UNEP/EA.4/Res.18[12]). They argue that the poverty–environment nexus is multi-dimensional, driven by factors such as power, greed, market and institutional failure, with the paradox that impoverished people often shoulder the negative impacts of a rapidly deteriorating environment disproportionately (Rai, 2019; Chen et al., 2020). This is underpinned by the link between environmental degradation, the sustainable management of natural resources, including climate change, and other environmental challenges for achieving social and economic development and eradicating poverty, in support of the needs of present and future generations. In particular, the impacts of climate change have devastating effects on the livelihood of certain coastal communities in Africa and are expected to worsen.

With respect to African investments, weak fiscal structures and legislative vacuums have resulted in illicit financial flows that allow for the perpetuation of criminal activities, such as IUU fishing, piracy, illicit trafficking of goods and people and environmental crimes. It should also be noted that the role of foreign governments in the blue economy in Africa can be a source of concerns. For instance, Chinese investments in the blue economy are increasing, especially in the shipping and fishing sectors, with a growing but still limited commitment to ensure sustainable financing. Similar concerns relate to Russian investments in the blue economy in connection with the food industry and resource exploitation. Russia is also planning to invest in port facilities to accommodate rising sea freight levels, with several major infrastructure projects planned. Recent agreements also position Russia as a key player in Africa, but the economic benefits remain to be seen.

At the same time, the economies of the countries in the study region are poised to grow over time. The largest sectors of the current African aquatic and ocean-based economy are fisheries and aquaculture. In addition, tourism, transport, ports, sea mining, and energy offer the potential for tremendous growth over the years. Converting this growth into quality growth, through the generation of inclusive wealth, within environmental limits and respecting the highest social considerations, is crucial. This is in essence what a “Sustainable Blue Economy” should strive for, *one that restores, protects and maintains diverse, productive and resilient ecosystems, and that is based on clean technologies, renewable energy, and circular material flows* (WWF, 2020); one that plays a major role in the region’s structural transformation that supports important social considerations, such as financial inclusion, the role of women in entrepreneurship, wealth retention and jobs creation, despite the constraints faced by vulnerable economies. A number of blue economy activities are viewed as promising sources of development for the region, but if not well managed, these activities may increase the pressure on ecosystems and negatively impact local communities, rather than supporting sustainable growth and social inclusion. Investments are needed to improve capacity, particularly in port infrastructure and the tourism sector. There is also a need to increase awareness of the sustainable blue economy – in the context of development policy and that of the green economy.

[12] Resolution adopted by the United Nations Environment Assembly on 15 March 2019

3. Characterization of socio-economic interests in ABNJ

3.1 The socio-economic dependency on marine ecosystem services

The conservation and sustainable use of natural resources and ecosystem services are prerequisites for a sustainable blue economy. By linking the ecosystem services provided by marine ecosystems to the socio-economic interests in ABNJ (Table 1), it is evident that the interests go beyond the economic sectors. A strong dependency between the different services exists, such as between the biotic provisioning (e.g. fisheries) and regulating and supporting services that determine the state of biodiversity. In contrast, the abiotic provisioning services (such as deep-sea mining, oil and gas exploration and exploitation) and other activities (such as navigation and transport/shipping, submarine cables/telecommunication) are not influenced by the state of biodiversity but in turn, exert pressures that deteriorate ecosystem conditions.

Table 1: Link between ecosystem services and socio-economic interests in ABNJ

Ecosystem service	Type	Socio-economic interests	Additional information
Consumptive activities			
Provisioning (biotic)	↗ Nutritional	↗ Fisheries	↗ Established economic sector (Section 3.2)
	↗ Nutritional	↗ Sea-farming/aquaculture	↗ Does not occur in ABNJ
	↗ Genetic resources Pharmaceuticals	↗ Marine genetic resources	↗ Emerging economic sector (Section 3.2)
Provisioning (abiotic; ecosystem-state independent)	↗ Raw materials	↗ Deep-sea mining	↗ Emerging economic sector (Section 3.2)
	↗ Raw materials/Energy	↗ Oil and gas	↗ Does not (yet) occur in ABNJ
Non-consumptive activities			
Supporting	↗ Biodiversity	↗ Biodiversity management/conservation	↗ Discussed in Section 3.3
	↗ Habitat for species		
Cultural	↗ Research	↗ Research and education	
	↗ Recreation and leisure	↗ Recreation, leisure and tourism	↗ Not discussed in detail here
	↗ Spiritual, symbolic and other interactions with biota, ecosystems, and seascapes	↗ Spiritual, symbolic and other interactions with biota, ecosystems, and seascapes	↗ Not discussed here. However, communications such as Turner et al. (2020) highlight the importance of cultural heritage related to the Middle Passage across slave-trade routes in the Atlantic ABNJ

Ecosystem service	Type	Socio-economic interests	Additional information
Non-consumptive activities			
Regulating and maintenance	↗ Mediation of flows	↗ Water circulation	↗ See Section 3.4
	↗ Mediation of physical, chemical, biological conditions	↗ Climate regulation	
	↗ Mediation of waste, toxics and other nuisances	↗ Carbon sequestration and storage	
		↗ Waste disposal (from offshore, e.g. shipping, and transported from land-based sources)	
Other (ecosystem-state independent)		↗ Navigation and transport/ shipping	↗ Established economic sector (Section 3.2)
		↗ Submarine cables/ telecommunications	↗ See section 3.5
		↗ Maritime security	

A recent study by the FAO (Ottaviani, 2020) analysed the economic value of ecosystem services from deep seas and ABNJ. Despite advances in the valuation methods, the attribution of a "price tag" to the ecosystem services provided by the international deep seabed and associated ecosystems and species remains challenging. That is because it is difficult to monetarily value: i. the role of the deep sea in regulating planetary systems, including global climate and carbon dioxide (CO_2) sequestration; ii. the interconnection between deep-ocean marine life and ecosystems throughout the water column on which humans already depend; iii. the potential for discoveries of new species and ecosystems that may expand our understanding of life on Earth; and iv. the potential to derive benefits from the genetic material of deep-dwelling organisms (extremophiles) for medicines and other purposes (Deep Sea Conservation Coalition, 2020). Moreover, the fundamental and intrinsic (including the cultural, religious and other services) value of biodiversity cannot be attributed a monetary value.

Despite the challenges associated with assigning this type of value, some studies did provide an estimation. The value of marine ecosystem goods and services, in addition to the traditional socio-economic uses of the ocean such as transportation, resource extraction and waste disposal, has been estimated in 1998 at a minimum US$ 20.9 trillion a year. Although highly approximative based on the limited information available, this figure is approximately 63 % of the total estimated value of all systems on Earth (UNEP, 2016). This highlights the importance of ecosystem services other than provisioning services, i.e. regulating, cultural and in particular supporting services (Figure 6), for which values cannot be easily quantified but which lie at the core of the socio-economic activities that depend on them. Recent discoveries of new and unique species and habitats in the deep ocean have shed light on oceans as the largest reservoir of biodiversity on the planet, providing many essential services with substantial socio-economic benefits that are often taken for granted. The diversity of species and maintenance of genetic diversity within populations enhance the resilience of marine ecosystems and their ability to adapt in the face of natural environmental variability and anthropogenic threats, such as climate change (Yadav and Gjerde, 2020). Some habitats have an exceptionally high number of species and a distinct, abundant and diverse fauna, making them

more genetically diverse than others. These 'biodiversity hotspots' typically found around seamounts, provide important feeding grounds for numerous species, as well as supporting fisheries and marine mammals. The Southeast Atlantic contains about 25 % of Earth's seamounts, especially abundant at the Mid-Atlantic Ridge, the Walvis Ridge and the Guinea Rise. The Southeast Atlantic also includes an important number of hydrothermal vent fields, located along the Mid-Atlantic Ridge. These provide habitats for communities, which albeit their low levels of diversity, they present high levels of diversity unique to a specific community (endemicity), as well as high biomass (Boteler et al., 2019).

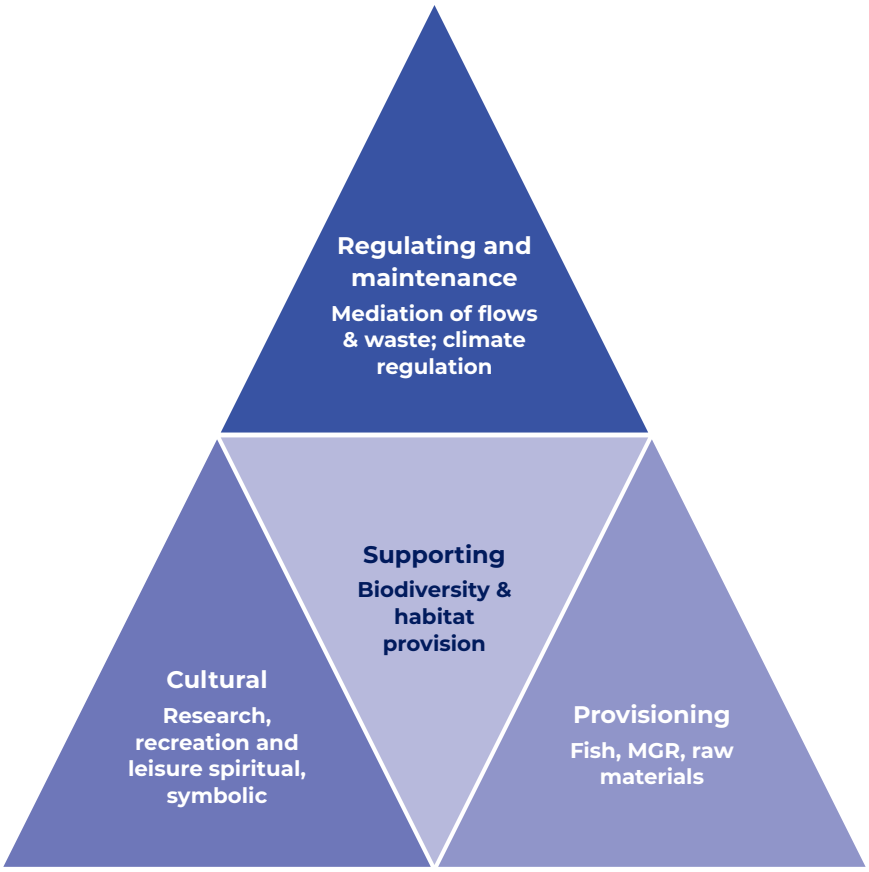


Figure 6: Schematic showing the four categories of ecosystem services provided by ABNJ and the central role of supporting ecosystem services in enabling other services. Source: Redrawn from Earthwise Aware (n.d.)

The market value of ocean resources is often the only available indicator of the state of marine resources. However, this value generally does not reflect the full price of the resource and the cost imposed on the environment or on society through unsustainable exploitation and practices, responsible for the depletion and in some cases near extinction of some populations (UNEP, 2016). In fact, the population of at least six of the top ten fish types caught in the Southeast Atlantic region analysed in Boteler et al. (2019) is decreasing, with the population of yellow-fin tuna, albacore tuna, blue shark classified as near-threatened; bigeye tuna as vulnerable; and Southern Blue tuna as critically endangered (IUCN Red List[13]). The future and long-term bene-

[13] www.iucnredlist.org/

fits of maintaining biological resources are often discounted, by focusing on the current or short-term cost of conservation. In the long-term, the lack of consideration for the effects of economic activity on habitats and ecosystem services may create costs which may exceed by far the short-term economic benefits of unsustainable exploitation and use. Also, certain ecosystem services, considered as non-market value resources, are not yet recognized or valued. This lack of direct market value means that their loss is often not, or not appropriately, taken into account in planning or management systems (UNEP, 2016).

The Global Risks Report 2020 (World Economic Forum, 2020) ranks "biodiversity loss" as the second most impactful and third most likely risk for the next decade. The accelerating pace of biodiversity loss is of particular concern. Today 60% of the world's major marine ecosystems that underpin livelihoods have been degraded or are being used unsustainably. Without significant changes, by the year 2100, more than half of the world's marine species may stand on the brink of extinction (IOC UNESCO, 2017). Marine biodiversity loss is increasingly limiting the ocean's capacity to provide food, maintain water quality, and recover from perturbations. This has critical implications for human well-being, affecting entire supply chains and socio-economic development. Climate change is exacerbating biodiversity loss, and the causality goes both ways: oceans are highly important for absorbing carbon emissions.

3.2 Key economic sectors

In the following sections, the four main existing and emerging economic sectors (fisheries, exploitation of MGR, deep-sea mining, and navigation and transport/shipping) in ABNJ of the Southeast Atlantic region are described in more detail. Most of the key economic sectors, with the exception of navigation and transport, rely on provisioning ecosystem services.

Other sectors, such as oil and gas exploration, sea-farming/aquaculture and tourism are not included as they typically occur in coastal and marine areas within the EEZ. However, their impacts, in particular impacts of oil and gas exploration, can also affect ABNJ.

Fisheries

Although significantly less active than coastal fisheries, fishing is undoubtedly one of the most important activities in ABNJ. It provides for 4.2% of the global annual marine capture fisheries, with three species accounting for 42% of the fish caught in ABNJ: skipjack (Katsuwonus pelamis), yellowfin (Thunnus albacares) and bigeye tuna (Thunnus obesus) (Schiller et al., 2018). These constitute the top three fish species caught in ABNJ of the Southeast Atlantic (Boteler et al., 2019). Most of the species caught in ABNJ are supplied to upscale markets in affluent and food-secure countries, such as Japan and the United States, or political/economic block such as the European Union, suggesting that overall ABNJ fisheries play a negligible role in ensuring global food security (Schiller et al., 2018).

The coastal population in the study region relies heavily on fishing for their livelihoods, from catching to selling to processing. Fishing in this area is predominantly done by drifting longlines, accounting for the fishing method of 59% of the vessels active in ABNJ. Longline fishing is controversial in some areas because of the amount of unwanted by-catch; other fish, immature juveniles of the target species and marine megafauna caught inadvertently or while seeking specific commercial fish. Of specific relevance to the Southeast Atlantic region are FAO Major Fishing Areas 34 and 47, which overlap with the study region (Figure 7).

Up until recently, data about distant-water fishing has been nearly inaccessible as companies and countries tend to be secretive about their activities in ABNJ. However, by virtue of satellite technology, individual fishing vessels can now be tracked. In 2016, the independent, international non-profit organization Global Fishing Watch (GFW)[14] began to make satellite tracking data publicly and freely available. Using cut-

[14] https://globalfishingwatch.org

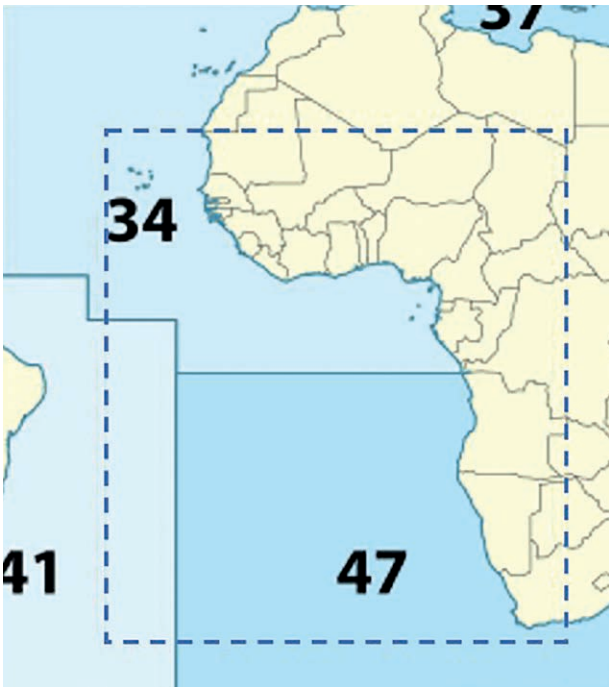


Figure 7: FAO Major Fishing Area 34 (Atlantic, Eastern Central) and 47 (Atlantic Southeast), partially overlapping with the study region (dashed box) | Source: FAO (2021)

ting-edge technology, global fishing activity can be visualized, tracked and shared in near real-time. GFW uses an automated identification system (AIS) and machine learning to automatically identify if a boat is fishing or just sailing. By knowing the characteristics of every vessel (size, tonnage, power of its engines, and the number of people on board) in the database, the cost and benefits of fishing in ABNJ (including costs of fuel, labour, depreciation, etc.) can now be quantified. Despite the limitations of AIS technology which presently does not yet detect all industrial fishing effort, the transparency of the socio-economic viability of fishing in ABNJ is increasing.

The study by Sala et al. (2018), based on data retrieved from vessel-tracking technologies, indicates that fishing in ABNJ is dominated by a handful of fishing countries and industries which reap most of the benefits. Recent information on the composition of the global ABNJ fishing fleet shows that 97% of the trackable industrial fishing in ABNJ are vessels flagged to higher-income nations, with less than 3% of effort attributed to vessels flagged to lower-income nations (Figure 8). The top five countries (China, Taiwan, Japan, Spain, and South Korea[15]) exert about 80% of the fishing effort in ABNJ. At the global level, China owns the highest number of vessels targeting ABNJ (838, equivalent to 23% of the overall vessels targeting ABNJ), yielding the highest catch (1523 thousand metric tonnes in 2016) and revenue (US$ 1624 million, equivalent to 20% of the total global high-seas fishing revenue). Revenues go primarily to distant water fishing nations (DWFNs) drawing questions on equity and justice.

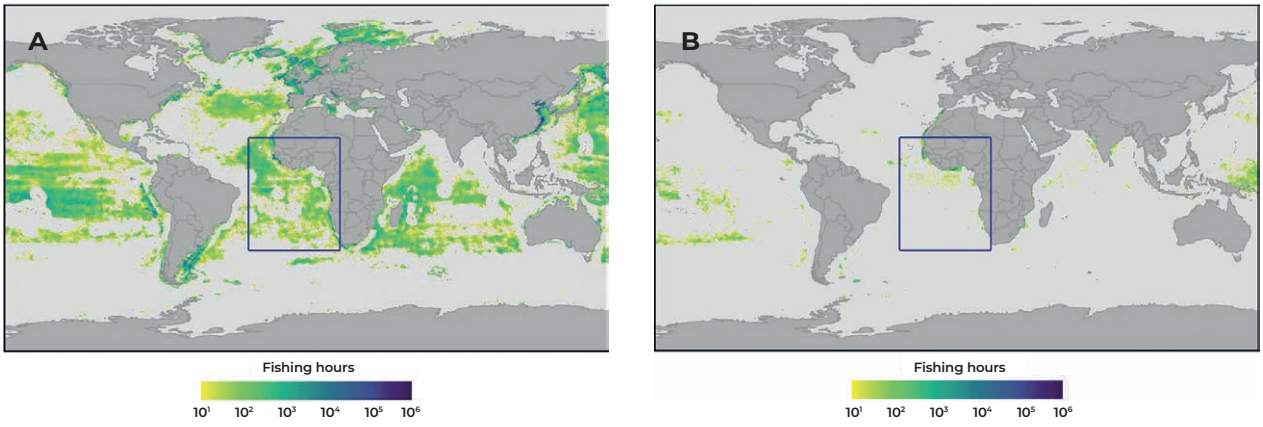


Figure 8: Density distribution of global industrial fishing effort, derived using automatic identification systems data. (A) Vessels flagged to higher-income countries and (B) vessels flagged to lower-income countries | Source: McCauley et al. (2018)

[15] These are (official country names, followed by short forms in brackets): People's Republic of China (China), Republic of China (Taiwan), Japan (Japan), Kingdom of Spain (Spain), and Republic of Korea (South Korea). For the sake of brevity, only short forms are used in the text.

Although most countries in the study region rely heavily on fishing in territorial waters, in particular artisanal fishing, only five out of 22 countries are active in ABNJ (Table 2). According to Sala et al. (2018), South Africa operates nine vessels in ABNJ, Ghana and Senegal eight and two vessels, respectively. The combined catch and revenue of these countries is each limited to around 1% of the global figures. Most countries cannot afford the vessels and equipment required for intense industrial and commercial fishing in the ABNJ, limiting their capabilities to exploit these resources (Oluwarore, 2018).

Table 2: Catch and revenue of ABNJ fishing for countries in the study region. Source: Sala et al. (2018).

Country (Flag State)	Catch (in tonnes)	Revenue (in US$ Million)
Ghana	50.61	78.14
Côte d'Ivoire	2.51	4.26
Namibia	2.11	6.26
South Africa	0.37	1.35
Senegal	0.2	0.32
Total for study region	**55.8 (1.3%)**	**90.33 (1.2%)**
Total global	**4390.67**	**7655.69**

Further analysis of the revenues for the study region (Figure 9) indicates that Ghana (US$ 78.14 million) is the forerunner in FAO Major Fishing Area 34, followed by France, Spain and Japan. The main revenues for Ghana are from purse seine fishing. Other countries from the study region are active in FAO Major Fishing Area 34 but with significantly lower revenues: Côte d'Ivoire (US$ 4.26 million) and Senegal (US$ 0.32 million). The key countries operating in FAO Major Fishing Area 47 are Japan, Spain and Taiwan. Namibia (US$ 6.26 million), South Africa (US$ 1.35 million) and Ghana (US$ 0.2 million) are also active in FAO Major Fishing Area 47 yielding modest revenues.

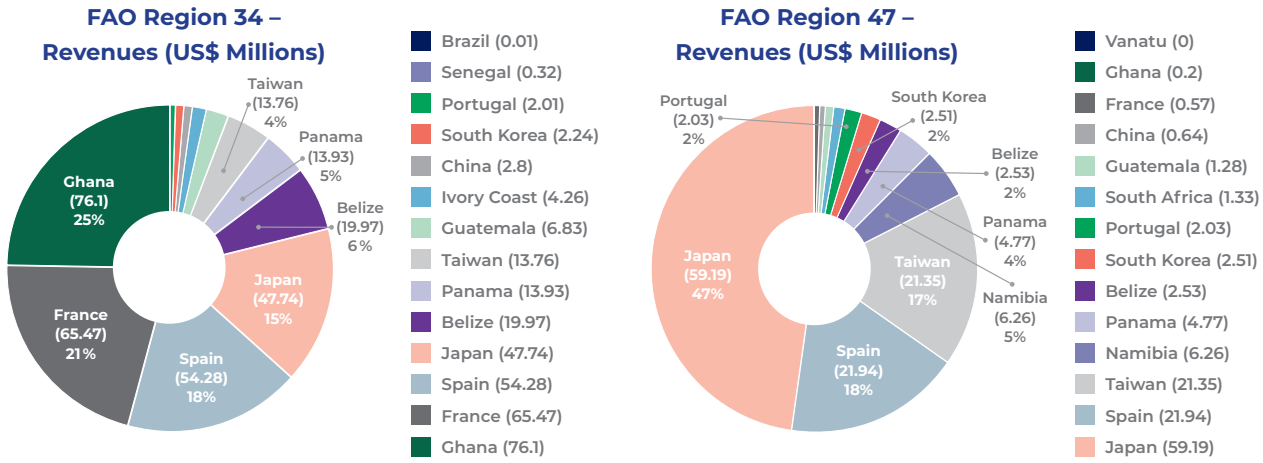


Figure 9: Revenues for countries (flag states) from fishing in ABNJ in FAO Major Fishing Areas 34 and 47. Data is for 2016. List of official country names can be found in the footnote[16] Source: Sala et al. (2018)

[16] The official country names (followed by short forms in brackets) are: Portuguese Republic (Portugal), Republic of Guatemala (Guatemala), Republic of Panama (Panama), Belize (Belize), Republic of Vanuatu (Vanuatu), The official names of the other countries in the figure have already been specified above. For the sake of brevity, only short forms are used in the text.

At the global level, an overall increasing trend in overfishing is observed, as indicated by the increase in the percentage assessed fish stocks that are fished at biologically unsustainable levels. Highly migratory species, such as tuna and sharks, move between EEZs and ABNJ and tend to be intensely fished and overexploited (Sala et al., 2018). Due to the strong connectivity of fish stocks across jurisdictional boundaries, the risk of negative effects due to overfishing and other stock-impacting activities in ABNJ can affect coastal countries (Boteler et al., 2019). The selective removal of specific species disturbs the complex trophic web interactions and modifies the ecosystem. The removal of the largest individuals of a species leads to a decrease in the average size of a species and might also lead to a change in trophic structure. The exploitation of fish in vulnerable ecosystems (e.g. seamounts) or other resource exploitation (e.g. mining, energy) may cause damage to habitats or feeding grounds, and consequently cause a loss of genetic diversity.

With the decline in fish stocks in the territorial waters typically fished by local small-scale fisheries, competition between industry and small-scale fishing is on the rise. Given that the catch in ABNJ is overexploited and with dwindling economic returns, some studies (e.g. White and Costello, 2014; Sumaila et al., 2015) have investigated the effects of closing the ABNJ to fishing. These pointed towards benefits on fisheries profits and yields due to fish spillover into EEZs, and stock conservation. Similarly, the report The Sunken Billions Revisited by The World Bank (2017) argued that on a global level, less fishing in the short-term would produce more and larger fish in the long-term with the potential of generating US$ 80 billion each year in net benefits.

Apart from overfishing, IUU fishing is a critical issue that affects fisheries in the study region and one of the greatest threats to marine ecosystems. IUU includes all fishing activities that break fisheries laws or occur outside the reach of fisheries laws and regulations. It takes advantage of corrupt administrations and exploits weak management regimes, in particular those of developing countries lacking the capacity and resources for effective monitoring, control, and surveillance (MCS). While illegal and unreported fishing occurs mainly in the territorial waters where most fish are caught, unregulated fishing is inherent to ABNJ as a result of patchy regulation, little enforcement of regulation on vessels, and the vast expanse of the ocean (Halford, 2013). The lack of regulation of fishing vessels gives way to other crimes, such as illegal immigration, human trafficking, drug trafficking and even modern slavery. For example, due to illegal fishing, the total estimated catches in West Africa are believed to be 40 % higher than reported catches (Agnew et al., 2009). Such levels of exploitation severely hamper the sustainable management of marine ecosystems, leading to monetary losses of more than US$ 2 billion a year in “invisible value chains” (see Section 4). “Invisible value chains” can mask labour trafficking, peonage systems, unsustainable resource use or health and sanitary issues, while simultaneously detracting from wider economic benefits and avoiding taxation (Österblom et al., 2020).

Marine Genetic Resources

Marine genetic resources (MGR), including questions on the sharing of benefits and definition of MGR, is one of the four elements being negotiated under the BBNJ “package deal”. Although there is currently no internationally agreed legal definition of MGR, it can be described as ‘material from marine plants, algae, animals, and microbial or other organisms, and parts thereof containing functional units of heredity of actual or potential value (Convention on Biological Diversity, Article 2)’. MGR exist in three possible modes: in situ (on-site in the ocean), ex situ (samples in collections, and no longer in the ocean, for example in gene banks or a biorepository), and in silico (information in databases) (Rabone et al., 2019). Marine scientific research and development may generate samples containing MGR that may be of interest for bioprospecting, i.e. the development of commercially valuable products for pharmaceutical, cosmetic and/or other applications (Jaspars et al., 2016).

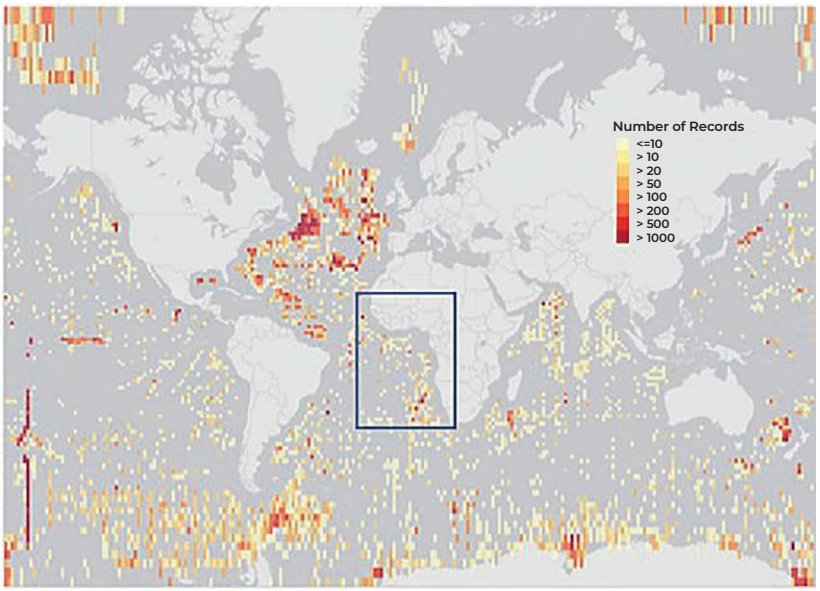


Figure 10:
Map of OBIS records from ABNJ from depths of 500 m and greater
Source: OBIS Mapper (n.d.)

According to the records in the Ocean Biogeographic Information System (OBIS)[17], a global open-access data and information clearing-house on marine biodiversity for science, conservation and sustainable development, there were 371 890 records of 10 437 species at depths of 500 m and greater between 1866 and 2018 (Rabone et al., 2019). Most of these records (71%) are from territorial waters; 25% are both from territorial waters and ABNJ, whereas only 3% of these records hold data only from ABNJ. The latter accounts for 4% of all species (equivalent to > 5000 species). In fact, most commercialized products come from territorial waters. The geographical distribution of these records is shown in Figure 10, reflecting the geographic biases and non-uniform participation in marine scientific research at the global level.

The analysis by Blasiak et al. (2018) provides evidence of the growing commercial interest in MGR, reflected in the increase in registration of patent claims involving MGR. As of October 2017, out of 38 million records of accessed genetic sequences associated with patents, 12 998 sequences were extracted from 862 marine species; >1600 sequences (1131%) from 91 species were associated with deep sea and hydrothermal vent systems, many of which are found in ABNJ. The majority of patents (73% of all patent sequences) are associated with microbial species which are often the focus for bioprospecting activities, followed by fish (16%) and molluscs (3%).

The identification and analysis of key actors registering patents presented in Blasiak et al. (2018) show that 84% of all patents were registered by 221 solo companies mainly located in Europe and the USA (Figure 11a), dominated by a single transnational key actor, BASF, the world's largest chemical manufacturer. BASF, headquartered in Germany, had registered 47% of all patent sequences (5701 MGR patent sequences), exceeding the second and third companies by an order of magnitude: Japanese biotechnology firm Kyowa Hakko Kirin Co. Ltd. (5.3%) and U.S.-based biofuel company Butamax Advanced Biofuels LLC (3.4%). Other actors included public and private universities (12% of patents), and entities such as governmental bodies, individuals, hospitals, and non-profit research institutes (4%) (Figure 11b). Yeda Research and Development Co. Ltd., the commercial arm of the Weizmann Institute of Science (Israel), registered 56% of all university patents, exceeding the combined claims of the 77 other universities.

[17] https://obis.org/

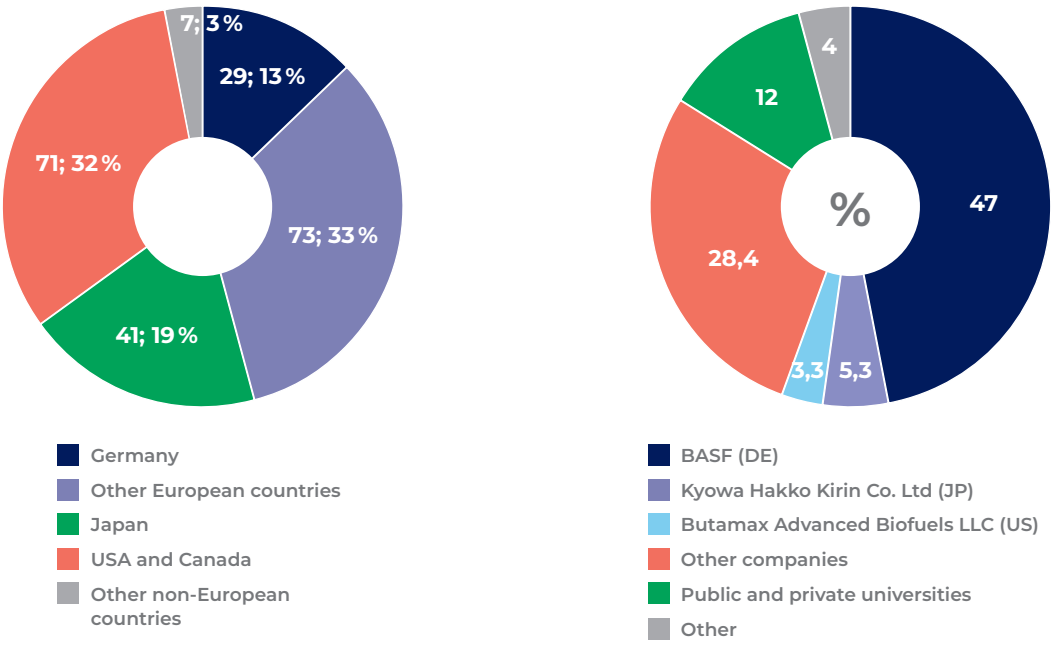


Figure 11: Distribution of (A) Countries of solo companies registering patents (number; %) and (B) Percentage of patents with international protection associated with MGR by entity between 1988–2017 (%) | Source: Blasiak et al. (2018)

This analysis points towards the emergence of a few distinguished "keystone actors" stemming from the world's most highly industrialized countries, which retain control of the potential for commercialization of the genetic diversity in the ocean. Blasiak et al. (2018) refer to the dominance of a small number of transnational corporations, with large corporations known to acquire smaller companies for the primary purpose of claiming ownership of their patent portfolios (Pauchard, 2017), taking advantage of branches located in countries with weaker institutions and limited monitoring or enforcement capacity (Young and Tvedt, 2017). Most patent applications do not disclose information on species provenance and MGR origins, limiting transparency and insights into the extent to which organisms derive from ABNJ.

The Nagoya Protocol on Access and Benefit Sharing (Secretariat of the Convention on Biological Diversity, 2011), adopted in 2010, defines the obligations associated with monetary and non-monetary benefit-sharing of genetic resources and their products sourced from within national jurisdictions. No such mechanism currently exists for ABNJ and the access and benefit-sharing mechanism for MGR, a major area of discussion during the BBNJ negotiations, still needs to be agreed upon and adopted. However, there is currently a lack of supporting evidence of the nature and scale of the commercial interest in MGR and the commercial potential and market application of MGR from ABNJ is largely still speculative (Leary, 2019; Tiller et al., 2020). While some commercial products have been developed from deep-sea organisms, the actual proportion coming from ABNJ is as yet unsubstantiated. This poses great uncertainties as to the level of the actual, as opposed to potential, benefits the commercialization of MGR from ABNJ may bring (Leary, 2019). To date, seven commercial products on the market have been derived from MGR, including one from a species found both in territorial waters and ABNJ (Broggiato et al., 2018).

Deep-sea mining

The emerging sector of deep-sea mining has attracted commercial interest in the Southeast Atlantic region. In particular, three types of deep seabed mineral deposits are of interest: polymetallic sulphides, polymetallic nodules, and cobalt-rich crusts (Figure 12). In the deep ocean, these different ore types contain various metals, including copper, cobalt, nickel, zinc, silver and gold, as well as lithium and rare-earth elements (Levin et al., 2020). However, economic profitability is highly dependent upon the levels of metal concentration within the ores. While these ores may be found in a particular location, this is not an indication that they contain a high metal concentration.

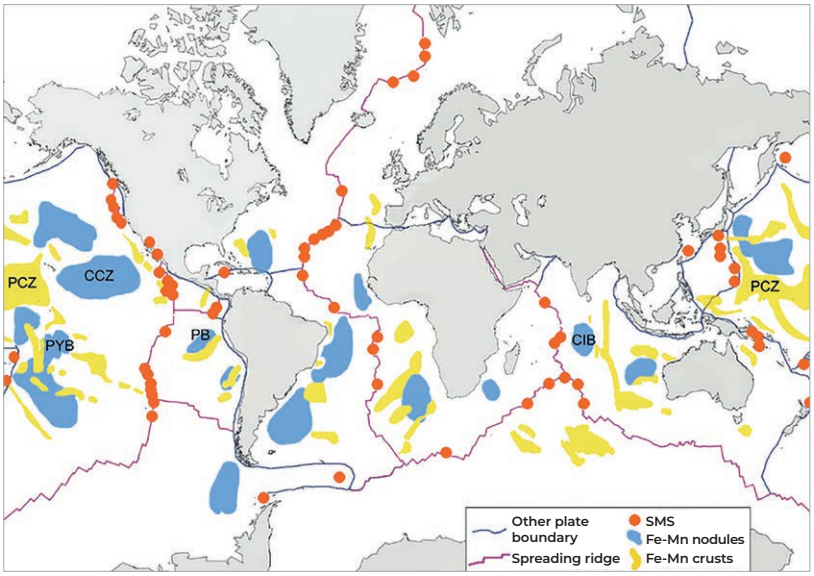


Figure 12:
Global distribution of the three primary classes of metal-rich deep-ocean mineral deposits: seafloor massive sulfides (SMS); ferromanganese (Fe–Mn) nodules; and ferromanganese (Fe–Mn) crusts
Source: Lusty and Murton (2018)

In ABNJ, mining activities on the seafloor (termed the Area, under the UNCLOS), and the protection of the marine environment from the impacts of those activities fall under the regulatory responsibility of the ISA. Established by UNCLOS, the ISA is mandated to manage seabed mineral activities for the benefit of mankind as a whole, with particular consideration for the interests and needs of developing countries, and to ensure effective protection for the marine environment from harmful effects of seabed mining activities. Currently, there are 167 members states of the ISA, plus the European Union, including all countries in the study region[18]. Since 2001, 30 exploration contracts covering more than 1.3 million km^2 have been granted by the ISA to individual states, consortia of states, state-owned enterprises, or companies working with states (Figure 13). Out of these 30 exploration contracts: 16 have been focusing on the deep-sea mining for polymetallic nodules in the Clarion Clipperton Zone (CCZ) in the eastern Pacific Ocean covering an area of some 1.2 million km^2 of the seabed; at least 18 are held by the following seven countries – China, France, Germany, India, Japan, Russia and South Korea – through their state-owned companies or government agencies and ministries; and seven are effective-

[18] https://isa.org.jm/member-states. The 22 countries in the region are all ISA member States. In addition, Cameroon, Gabon, Nigeria and South Africa are also member States with Permanent Missions.

ly in the hands of three companies: DeepGreen, a privately held Canadian company; UK Seabed Resources, a subsidiary of US-based Lockheed Martin; and Global Sea Mineral Resources, a subsidiary of the Belgian company DEME Group (Deep Sea Conservation Coalition, 2020). According to the regulations of the ISA, a state-owned or private sector enterprises must be sponsored by a government of an ISA member country – the sponsoring State – to obtain a contract from the ISA to mine. The ISA is required to provide for the equitable sharing of financial and other economic benefits derived from mining activities in the Area between member States. There are currently 20 sponsoring States in total, including six who jointly sponsor (Deep Sea Conservation Coalition, 2020). None of the sponsoring States are from the study region, and no African country is directly involved in deep-sea mining, be it as a contractor or sponsoring State. Discussions on how financial benefits of deep-sea mining will be shared among ISA member States, for example through royalty payments, are currently underway. The royalty regime obliges all contractors (for example, state-owned enterprises) issued with mining contracts by the ISA to pay a fee to the ISA, which would be shared equitably among member countries. A state/sponsoring State may be exposed to liability under international law for environmental harm resulting for exploration or exploitation of seabed minerals. Despite the lack of clarity in this respect, it would be risky for developing countries to engage in deep-sea mining in the Area given the possibility of failing meeting "standards" for exploration/exploitation.

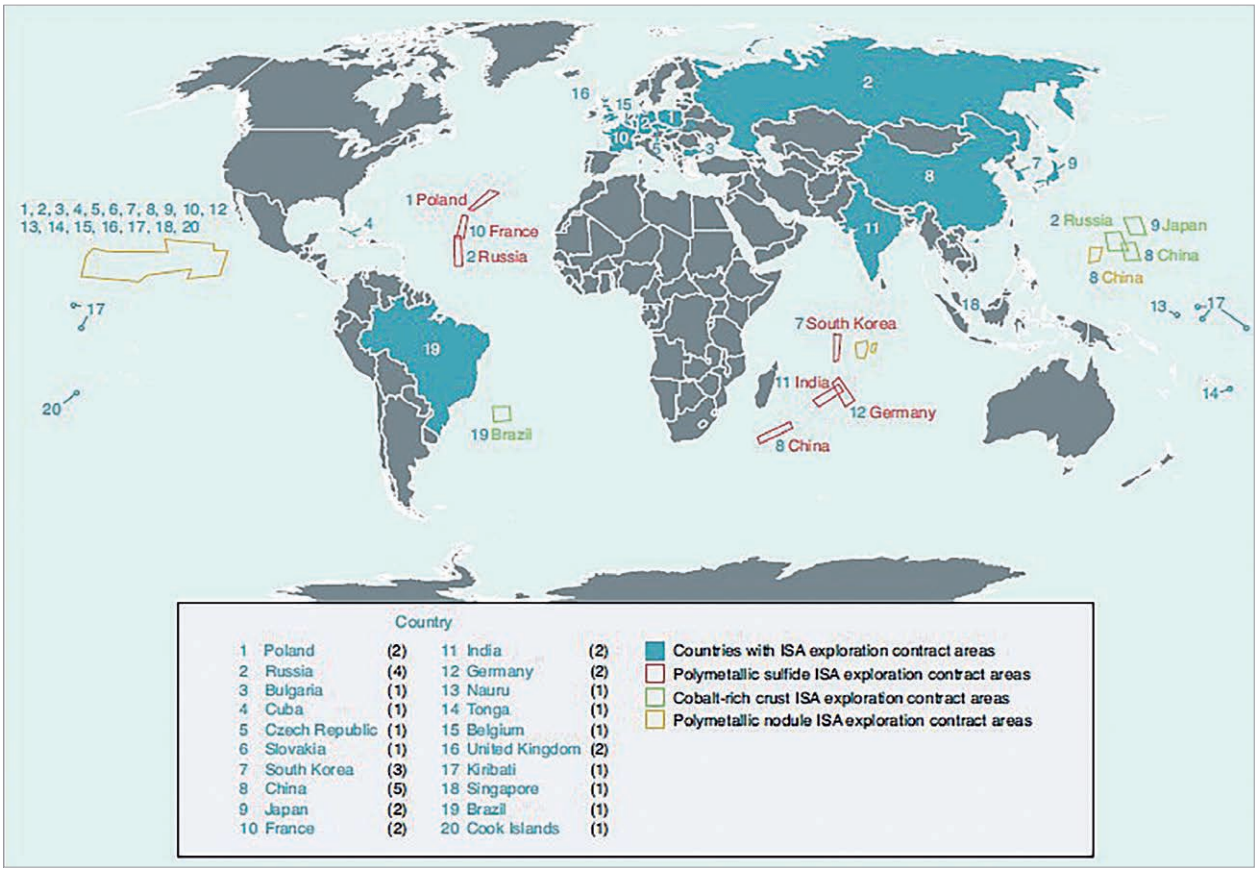


Figure 13: International deep seabed mining exploration contracts and countries
Source: Levin et al. (2020)

Besides the countries that have exploration contracts from the ISA, there are other stakeholders that are interested in the development of the sector to a various extent. These include countries that have deep-sea mineral deposits of commercial interest within national jurisdictions (for example, Papua New Guinea, Tonga, Cook Islands, Namibia, Japan and Kiribati) and countries that actively mine the same minerals on land (for example, Democratic Republic of Congo, Chile and South Africa). In total, more than 100 companies and consortia expressed their interest in deep-sea mining[19], of which at least 45 are located in Europe.

The Regional Environmental Management Plans (REMPs) led by the ISA aim to address the impacts of seabed mining and the protection of ecosystems. They are instruments that spell out goals, guidelines, and specific management measures particular to a specific region where mining could occur. REMPs can be considered as spatial planning/ABMT tools, whereby the main protection measure offered is the designation of areas of particular environmental interests (APEIs) located within the region but outside current areas of mining interests. Efforts are ongoing to establish a REMP for the Mid-Atlantic Ridge, second to the REMP for CCZ. The China Ocean Mineral Resources Research and Development Association (COMRA), a mining contractor, initiated developing and implementing a REMP in the North Atlantic in 2018 by offering to collaborate with the ISA e.g. through providing first ideas and hosting a workshop[20]. Other priority areas, such as the Northwest Pacific and the Indian Ocean are expected to follow.

Deep-sea mining is a controversial topic, especially among scientists studying life in the deep sea and people interested in its protection. The sector is still in its infancy, and understanding of its potential impacts and vulnerability of the deep-ocean ecosystems to human stressors is still very limited. If the industry eventually moves forward, the footprint of deep-sea mining could bring about local extinction of a large number of known and undiscovered deep-sea organisms (Menini, 2020). Recent studies by environmental advocacy groups, intergovernmental organizations and non-governmental organizations, such as Deep sea Conservation Coalition, Greenpeace, Flora and Fauna International, IUCN, WWF, and The Pew Charitable Trusts on its potential environmental impacts, the extent of risk, destruction and degradation of deep seabed ecosystems, biodiversity loss, and other impacts on the broader marine environment call for an urgent moratorium on deep-sea mining (Deep Sea Conservation Coalition, 2020).

Navigation and transport/shipping

Almost any activity in ABNJ, ranging from merchant shipping and trade, fisheries, marine research, maritime security, installation of structures, as well as recreation, leisure and sport activities, such as the Ocean Race[21] and Vendée Globe[22], involves navigation. Figure 14 shows the distribution of maritime traffic and types of vessels in the study region, indicating the predominance of tanker navigation along the shores and cargo transportation further offshore.

[19] http://www.savethehighseas.org/wp-content/uploads/2017/03/Table_Companies-with-an-interest-in-deep-seabed-mining_May2017-1-1.pdf

[20] https://www.isa.org.jm/news/comraisa-outline-first-steps-developing-and-implementing-regional-environmental-management

[21] https://www.theoceanrace.com/en/route.html

[22] https://en.wikipedia.org/wiki/Vendée_Globe

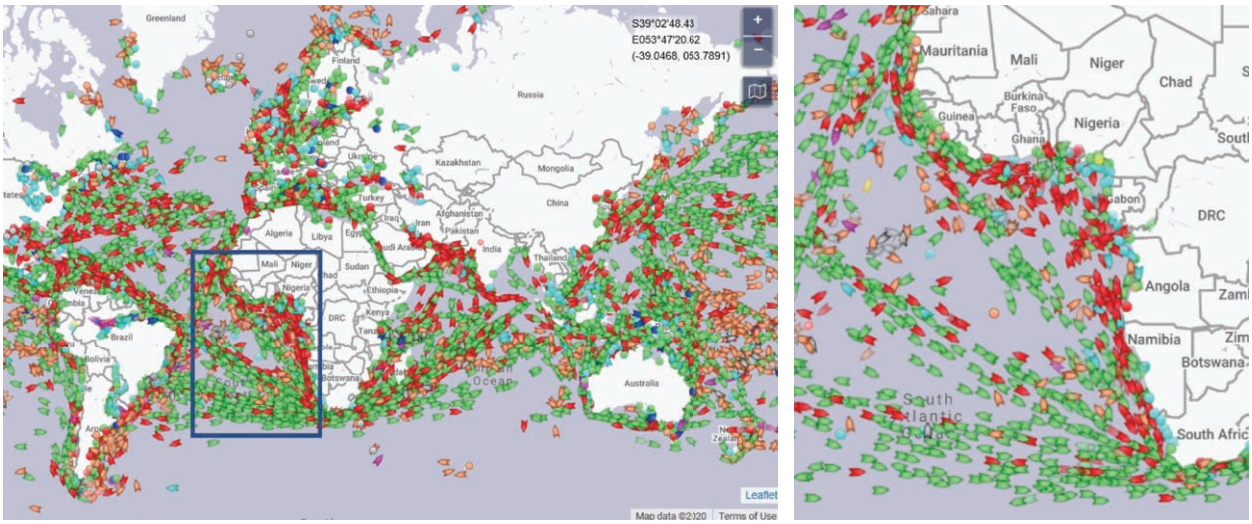


Figure 14: Map showing maritime traffic based on AIS technology. Colour code: Green: Cargo vessel; Red: Tanker; Orange: Fishing; Purple: Pleasure craft; Dark blue: Passenger vessel; Light blue: Tugs and special craft; Grey: Unspecified ship
Source: Marine Traffic Live Map (2021)

Maritime transport remains the main gateway to the global marketplace, with around 90% of all goods moved across the world by ships (OECD website[23]). The vast scale of the shipping sector worldwide is captured by the map in Figure 15, showing the movement of the global merchant fleets. The transportation of dry bulk of, for example, oil and chemicals by tankers, and manufactured goods by container ships predominate in the study region. Like many other economic sectors, the COVID-19 pandemic that started at the end of 2019 has impacted the shipping industry, requiring an international response to ensure that shipping services can continue with the undisrupted transportation of food, energy and medical supplies across the continents.

Merchant vessels are registered or licensed under the jurisdiction of their flag State, which gives the right to all States, including landlocked States, to sail ships flying their flag. In some cases, a merchant ship is registered in a State other than that of the ship's owners. This business practice, known as “flag of convenience” aims to reduce operating costs, to benefit from fiscal advantages and to avoid environmental and security restrictions, regulations, inspection and scrutiny by the country of the original owner. Although UNCLOS requires that there is a genuine link between the operator of the ship and the flag state; in reality, the connection is often relatively weak (Ringbom and Henriksen, 2017).

[23] https://www.oecd.org/ocean/topics/ocean-shipping/

The study region relies heavily on ships and ports to service its intercontinental trade, yet the current port infrastructure is insufficient to meet the higher demands of international shipping companies (Streatfeild, 2018). The increasing container volumes and ship sizes have exacerbated the need to improve port infrastructure and move towards deep-water terminals able to better process larger and more efficient ships. Several new port developments are being planned or constructed along the West African coast to accommodate for population and economic growth in general, and more specifically to growth linked to tourism, transportation and fishing. Albeit fluctuating, the quality of port infrastructure in the study region is generally improving (Table 3). The construction of seaports induces significant coastal changes, adversely impacting the evolution of the adjacent coastline and threatening adjacent ecological habitats, coastal livelihoods, as well as the operability of the port itself.

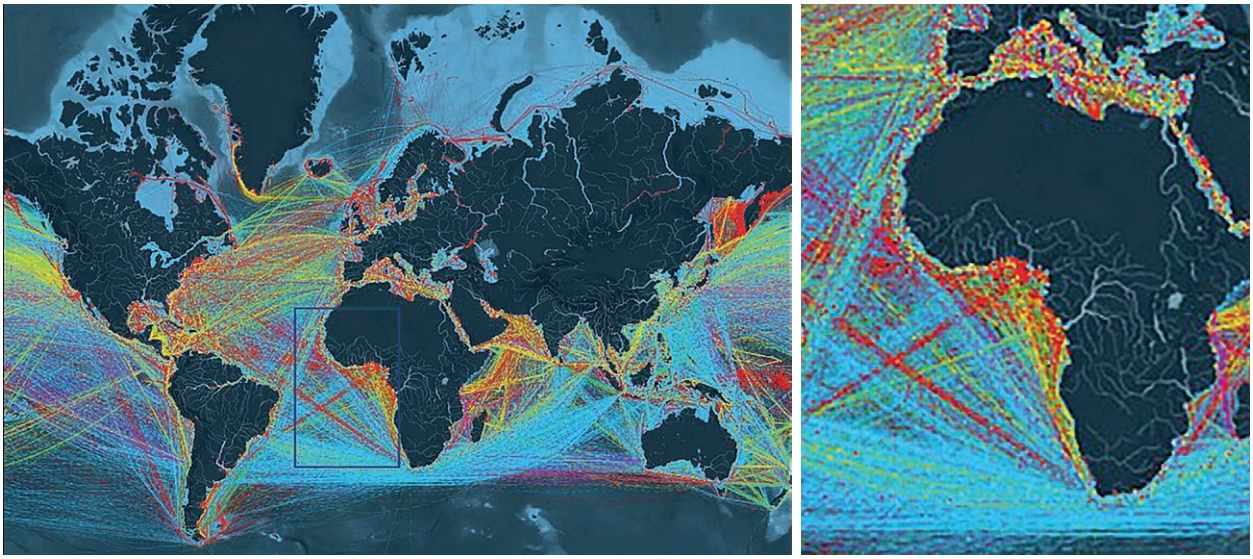


Figure 15: Map showing the movements of all ships in the global merchant fleet during 2012, the most recent year with complete data. Colour code: Yellow: Container (e.g. manufactured goods); Blue: Dry bulk (e.g. coal, aggregates); Red: Tanker (e.g. oil, chemicals); Green: Gas bulk (e.g. liquefied natural gas); Purple: Vehicles (e.g. cars) | Source: Will (2017)

Table 3: Quality of port infrastructure. 1=extremely underdeveloped to 7=well developed and efficient by international standards. | Source: World Bank TCdata360, 2021

Country*	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Angola				2.1	2.3		2.9	2.7			
Benin	2.9	3.2	3.3	4.0	3.9	3.7	3.7		3.4	3.4	3.9
Côte d'Ivoire		4.8	5.0	5.0	4.9	4.6	4.5	5.1	5.2	5.2	
Cameroon	2.6	2.7	2.7	3.3	3.5	3.7	3.7	3.6	3.3	3.3	3.1
Dem. Rep. Congo.											2.7
Cape Verde				3.5	3.8	3.9	3.8	3.9	3.7	3.7	3.6
Gabon						2.6	2.7	3.1	3.2	3.2	
Ghana		3.5	4.0	4.5	4.2	4	4.2	3.7	3.5	3.5	3.6
Guinea						3.5	3.2	2.9	2.9	2.9	3.4

Country*	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Gambia, The	4.1	4.1	4.7	5.1	4.9	4.8	4.6	4.2	4.1	4.1	4.4
Liberia						4.1	3.4		3.6	3.6	3.2
Mauritania	2.6	2.7	3.5	3.6	3.3	3.7	2.9	2.4	2.7	2.7	2.6
Namibia	5.0	5.3	5.4	5.6	5.5	5.4	5.3	5.2	5.2	5.2	5.2
Nigeria	2.7	2.6	2.8	3.0	3.3	3.6	3.4	3.2	3.0	3	2.8
Senegal	3.6	3.8	4.4	4.7	4.5	4.5	4.8	4.4	4.1	4.1	4.4
Sierra Leone						3.3	3.6	3.4	2.8	2.8	3.3
South Africa	4.4	4.4	4.7	4.7	4.7	4.7	4.7	4.9	4.9	4.9	4.8
World	**4.03**	**4.07**	**4.20**	**4.30**	**4.25**	**4.26**	**4.20**	**4.12**	**4.04**	**4.04**	**4.06**

*Note that only countries from the region for which data is available are included

Another index, the Liner Shipping Connectivity Index[24], provides a proxy for maritime connectivity of a country to global shipping networks based on five components: i. number of ships, ii. their container-carrying capacity, iii. maximum vessel size, iv. number of services and v. number of companies that deploy container ships in a country's ports. In 2019, UNCTAD expanded the coverage of the index and introduced a new port liner shipping connectivity index for more than 900 ports. A clear overall increase in the Liner Shipping Connectivity Index is observed for most countries in the region for the last 15 years (Figure 16). The Review of Maritime Transport (UNCTAD, 2020a) signals a "growing connectivity divide" – an increasing discrepancy between the most and least connected countries, attributed to the enhanced competitiveness of the most connected countries and the lack of resources and investments for the least connected countries to attract additional regular container shipping services.

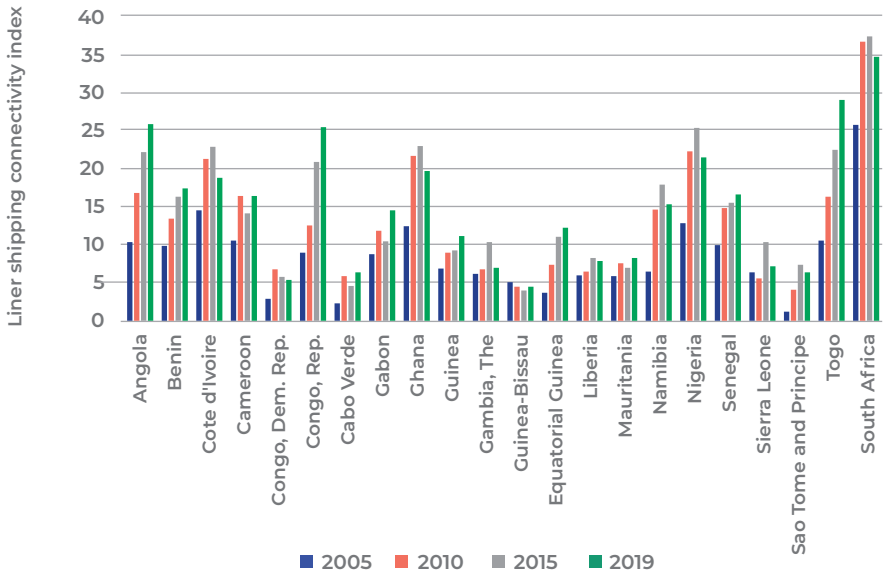


Figure 16: Liner Shipping Connectivity Index. Maximum value in 2004 = 100
Source: World Bank TCdata360 (2021)

[24] Liner shipping is the service of transporting goods by means of high-capacity, ocean-going ships that transit regular routes on fixed schedules.

Maritime transport is a major source of pollution, including air, oil, marine litter, artificial light and underwater noise, and poses a risk to marine mammals due to collisions. It is a growing emitter of greenhouse gases, contributing to around 940 million tonnes of CO_2 annually and about 2.5% of global greenhouse gas emissions (IMO, 2015). MARPOL, the International Convention for the Prevention of Pollution from Ships, is concerned with preventing marine pollution from ships. Specifically, Annex VI of MARPOL addresses air pollution from ocean-going ships. Advancing towards sustainable shipping, cleaner transport alternatives and new technologies offer opportunities for developing economies. Given that most countries in the region are in an early stage of development of shipping and port sector, integrating relevant sustainability principles and criteria at early stages of infrastructure investment and planning will also serve to reach their ambitions of a sustainable blue economy.

3.3 Supporting and cultural services

Other interests in ABNJ relate to the array of supporting and cultural services provided by marine ecosystems, in particular in relation to the maintenance of biodiversity and provision of habitats.

Biodiversity management/conservation

The preservation and protection of ABNJ, the largest reservoirs of ocean biodiversity, from the threats of climate change, pollution and impacts of unsustainable practices safeguards the health and resilience of the unique marine ecosystems they host. Due to the importance of ecological connectivity, the health of ABNJ also affects the social and ecological benefits reaped from territorial waters, in particular from fisheries, since overfishing key species in ABNJ can have devastating consequences for the livelihood of coastal countries. In a similar way, protecting migratory species of interest for wildlife-based marine tourism, e.g. dolphins, whales, turtles, seabirds, safeguards the economic sustainability of these activities, which is a source of revenue for local economies in certain countries, such as Benin (GIZMAC-BENIN 2019, GIZMAC-BENIN, 2020).

The current legal and institutional framework to protect and conserve marine biodiversity in ABNJ is characterized by large gaps, such as the absence of global rules to establish marine protected areas (MPAs), including cross-sectorial ones, and other effective conservation tools[25]. Currently, less than 1% of ABNJ is protected, with some arguing that this should be increased to at least 30% to achieve long-term biodiversity conservation objectives. Measures are being taken to increase the protection of the ocean and its biodiversity and move towards more sustainable management. Spatial tools are used for the identification of areas of special ecological or biological importance e.g. Ecologically or Biologically Significant Marine Areas (EBSAs) selected based on scientific criteria under the Convention on Biological Diversity (CBD), such as biological diversity and productivity, uniqueness, special importance for life-history stages of species and importance for threatened, endangered or declining species and/or habitats (Figure 17). Important biodiversity sites in ABNJ worldwide are identified by other organizations, including BirdLife International, an implementing partner of the STRONG High Seas project, Pew Charitable Trusts, Greenpeace and others. These sites, which could inform the “first generation of high seas MPAs” would allow the creation of a network that links across habitats to benefit highly migratory species, such as seabirds, whales and turtles. To realistically achieve conservation and sustainable use objectives, it will not be enough to set quantitative targets for MPAs. In addition, it should be ensured that key areas of biodiversity are protected and integrated in coherent and well-managed networks, as well as embedded in a broad, integrated ecosystem-based ocean management approach.

[25] https://www.iucn.org/commissions/world-commission-protected-areas/our-work/high-seas

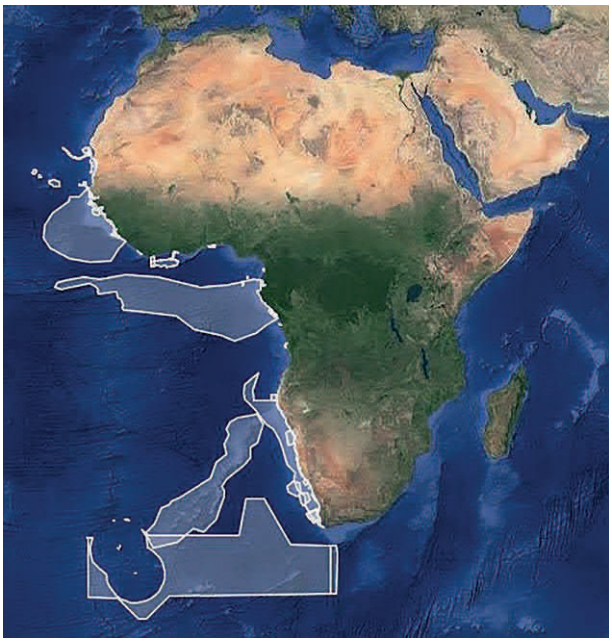


Figure 17: Map showing areas meeting the EBSA criteria in Southeast Atlantic region. | Source: https://www.cbd.int/ebsa/

Marine ecosystems are subject to unprecedented biodiversity loss. According to the Global Assessment Report on Biodiversity and Ecosystem Services (IPBES, 2019), over one-third of marine mammals and nearly one-third of sharks, shark relatives, and reef-forming corals are threatened with extinction. The extinction of one species can detrimentally affect other species or even entire ecosystems. Biodiversity loss distorts the ocean's functional and ecosystem services provision. It has critical implications for humanity, from the collapse of food and health systems to the disruption of entire supply chains. The preservation of habitats benefits biodiversity, since migratory and nursery habitats offer provisions for feeding, reproduction and juvenile maturation. Migratory species are particularly vulnerable to habitat destruction because they tend to inhabit more than one natural habitat. Conservation efforts need to be stepped up to protect the gene pool of the oceans in the face of biodiversity loss.

Acknowledgement of the potential values of biodiversity led to a search for innovative "blue financing" solutions to enhance ocean protection and resilience, and unlock its economic potential. This has prompted the launch of "blue bonds". Blue bonds follow the same components of the Green Bond Principles[26] with the difference that the proceeds are specifically used to finance marine and oceanbased projects or to safeguard the blue economy. The world's first sovereign Blue Bond was launched by Seychelles in 2018 (World Bank, 2018) in support of protecting at least 30 % of its territorial waters, followed by the issuing of the first Nordic-Baltic Blue Bond in 2019 (NIB, 2019). The Nature Conservancy, an international notforprofit organization, recently unveiled plans to mobilize US$ 1.6 billion of funding for global ocean conservation efforts through blue bonds under a scheme known as the "Blue Bonds for Conservation". This scheme provides upfront capital for protecting the oceans through a conservation trust fund used exclusively to finance marine management, protection programs and research programs and to ensure long-term funding for marine protection efforts.

Marine research

Marine scientific research is regulated under UNCLOS which grants the right for any State or competent international organization to conduct research on the condition that it is carried out exclusively for peaceful purposes and with appropriate scientific methods and means. In addition, research in the Area is to be carried out "for the benefit of mankind as a whole". There is a significant need for marine scientific research, as ocean ecosystems and processes are currently understudied. This lack of knowledge inhibits both conservation and sustainable use of ocean resources in ABNJ. From the interviews conducted with representatives from the countries in the study region, it appears the participation of local scientific institutions in research activities conducted in the adjacent ABNJ is limited.

[26] Green Bond Principles by the International Capital Market Association (ICMA) include: the use of proceeds must be for projects that address key environmental concerns, a process for project evaluation and selection must be in place, a formal internal process to track the application of, and management of, proceeds must be applied, and annual reporting on the use of proceeds must take place (https://www.icmagroup.org/green-social-and-sustainability-bonds/green-bond-principles-gbp/).

The Intergovernmental Oceanographic Commission (IOC) of UNESCO currently provides important ocean science services in its role of coordinator of programmes in marine research, services and capacity building and promotor of international cooperation. The IOC is mandated to lead the preparation phase of the UN Decade of Ocean Science for Sustainable Development 2021–2030 (the Ocean Decade), which aims to accelerate knowledge about the oceans (IOC UNESCO, 2020). Research needs include the development of a comprehensive digital atlas of the entire ocean, expanding observations infrastructure in ABNJ, enhancing understanding of the connectivity between environmental and human processes, increase knowledge, applications and services related to MGR, and improve forecasts and predictive capacity (IOC UNESCO, 2020). The Ocean Decade aims to build synergies between the UN 2030 Agenda and the BBNJ agreement, recognizing that the success of the implementation of an eventual BBNJ agreement strongly depends on robust ocean scientific knowledge and services, including information and data, capacity building and transfer of marine technology. To this aim, IOC is developing a Clearing House Mechanism that will serve as a centralized platform to enable access to data and information on: (i) activities and scientific knowledge related to MGR of ABNJ; (ii) sharing of monetary and non-monetary benefits; (iii) environmental impact assessments (EIA); (iv) opportunities for capacity building and marine technology transfer; and (v) research collaboration and training opportunities.

3.4 Regulating and maintenance services

Amongst the main regulating and maintenance services provided by marine ecosystems are the mediation of flows, and the maintenance of physical, chemical and biological conditions.

Mediation of flows and maintenance of physical, chemical and biological conditions

Of outmost importance to ABNJ are the key regulating and maintenance ecosystem services – water circulation, climate regulation, carbon sequestration and storage, in particular to those economic sectors that rely on biotic resources. Water circulation is driven by ocean currents and movement of water masses across the water column. It is the process that supports oceanographic connectivity, regulates water temperature and the exchange of oxygen, nutrients, sediments and other inorganic substances, setting the habitat conditions for living organisms. The ocean plays an important role in climate regulation by absorbing a large amount of the sun's radiation. Recent estimates suggest that the marine environment has absorbed 90% of the excess heat trapped by anthropogenic greenhouse gas emissions since 1995 (IPCC, 2019). Carbon sequestration by the oceans through the uptake of CO_2 and its transport and storage in deep-sea compartments is another important ecosystem service in the regulation of atmospheric CO_2 concentration. The ocean holds about fifty times more CO_2 than the atmosphere (Bopp et al., 2017). Carbon sequestration and storage act as a sink for atmospheric carbon, slowing climate change. However, increased levels of CO_2 in the atmosphere are causing the acidification of the oceans. Ocean acidification makes it difficult for marine organisms, such as coral and some plankton, to form their shells and skeletons, and may cause existing shells to start to dissolve. Although scientists have long recognized the importance of oceans in climate regulation, it is only recently that politicians are becoming more aware of the role of oceans.

The economic benefits and valuation of the regulatory services provided by ABNJ are extremely difficult to quantify. The processes at stake are complex, casting scientific uncertainty and lack of data on the governing biophysical links and relationships. In a recent economic valuation study of the ecosystem services from deep seas and ABNJ below 200 m (Ottaviani, 2020), the benefits from carbon sequestration were estimated based on the flux of carbon ($GtCO_2$/year) transported to the deep seas and the economic value of reduced emissions of CO_2 in the atmosphere. The latter can be assessed using a different unit price (US$/tonne of CO_2), attributed to the market price of reduced carbon emissions in the carbon market; and to the higher social costs related to increased

carbon emissions (Ottaviani, 2020). The choice of the unit value was a key determinant in the overall total economic value (TEV) outcome. With a unit of price of US$ 8.5/tonne of CO_2, the TEV as a whole was estimated at US$ 267 billion per year, of which 1% was attributed to carbon sequestration. When a higher unit price was applied (US$ 417/tonne of CO_2, reflecting both market prices and incurred social costs), the overall global TEV increased to US$ 423 billion per year. The relative contribution of carbon sequestration increased to 38%, closer to the value of the extraction of abiotic resources (58%), indicating the importance of carbon sequestration in economic terms.

Waste mediation

Although the marine environment holds the capacity to dilute, absorb and break down (detoxify) waste disposed into the ocean from industries and ships, this comes with significant harm to biodiversity and human health. Industrial and sewage wastes containing chemicals like mercury, cryolite and DDT[27], and radioactive industrial wastes are extremely toxic even at low concentrations. Exposure of organisms to chemicals can lead to toxicological effects on fish, mammals and molluscs, potentially impacting human health through the food chain. Toxic substances cause oxygen depletion and can have an impact on fisheries leading to negative, social implications. Marine debris can be ingested or cause entanglement by organisms, posing a direct threat to marine biota. Discharge of ballast water by ships constitutes another source of dumping. Ballast water may contain non-native, nuisance, exotic species that potentially cause extensive ecological and economic damage to aquatic ecosystems.

Among all sorts of activities that pollute the ocean, the dumping of garbage and other plastic material causes the most concern in general[28]. Ryan (2013) reported the accumulation of floating debris in the South Atlantic gyre (34–35°S), forming the so-called South Atlantic garbage patch (Figure 18) composed mainly of non-biodegradable plastic litter (97%). A rapid growth in debris originating from Asia was recorded in 2018, mainly from China, indicating that ships are responsible for most of the debris, in particular plastic drinking bottles, floating in the central South Atlantic Ocean (Ryan et al., 2019).

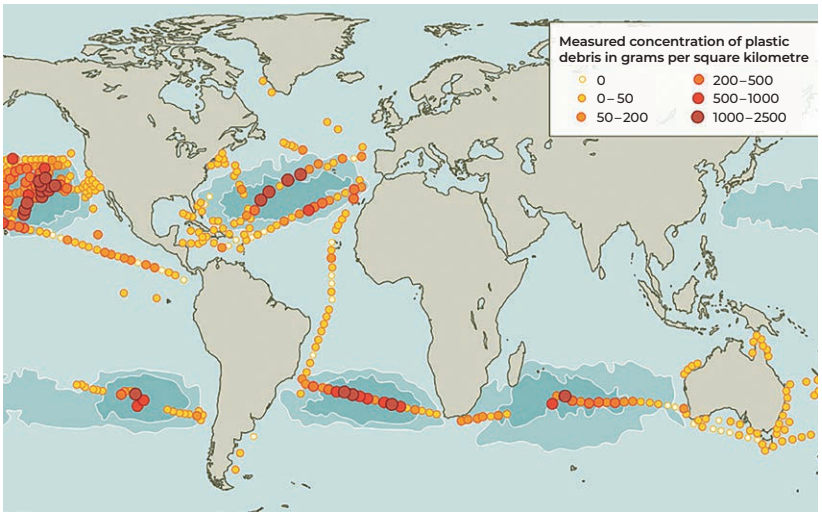


Figure 18:
Distribution of measured plastic debris concentrations. The highest concentrations of 1000–25000 grams per square kilometer can be found in the major ocean gyres, including the South Atlantic gyre (34–35°S)
Source: Modified from Cózar et al. (2014); retrieved from Maribus et al. (2015)

[27] Dichlorodiphenyltrichloroethane
[28] https://www.marineinsight.com/environment/causes-and-effects-of-ocean-dumping/

3.5 Other activities and interests

Other activities in ABNJ include the laying of submarine cables and activities related to maritime security. Navigation and transport/shipping listed under category "Other" in Table 1 is considered as a key economic sector and described under Section 3.2.

Submarine cables/telecommunications

There are currently around 406 submarine cables, measuring 1.2 million kilometres, in service around the world. This figure is constantly changing as new cables enter service, and older ones are decommissioned[29]. In contrast to the northern Atlantic, there are only a few transatlantic cables in the south, reflecting the relatively low internet data traffic between the study region and other areas (Figure 19). Cables are normally buried in the seabed to protect the cable against other users of the sea, such as bottom trawling. In offshore areas, they are laid directly on the seafloor, following safe, commercially-viable and environmentally neutral routes, and avoiding obvious natural hazards, zones of biological significance and cultural heritage sites, where possible (The International Cable Protection Committee, 2016). When a cable is decommissioned, it is allowed they remain inactive on the seafloor. Cable faults occur on an average of 100 per year, with accidents like fishing vessels and ships dragging anchors accounting for two-thirds of all faults. Most faults, however, are concentrated on the continental shelf in depths less than 200 m.

Submarine cables are used to transfer data for telecommunications through fibre-optic technology. They provide internet access to a range of users – telecom carriers, mobile operators, multinational corporations, governments, content providers, and research institutions. Submarine cables have advantages over satellite links due to their reliability, signal speed, capacity and cost. Although traditionally owned by consortia of telecom carriers, since the late nineties a number of private cables were installed by entrepreneurial companies, including content providers such as Google, Facebook, Microsoft and Amazon.

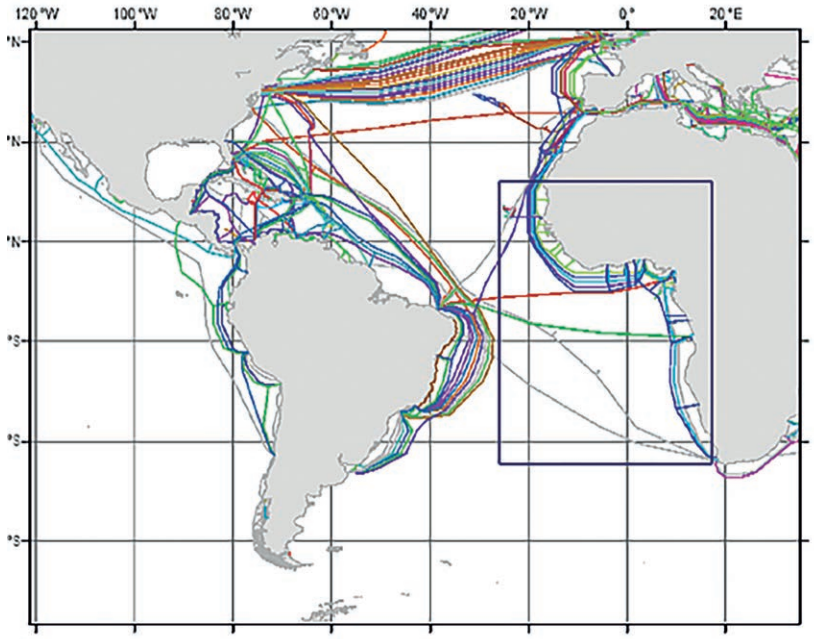


Figure 19:
Map showing the submarine cable network in the study region | Source: Submarine Cable Map (2019)

[29] https://www2.telegeography.com/submarine-cable-faqs-frequently-asked-questions

Maritime security

ABNJ are subject to activities related to "the passage of military force either for diplomacy or against targets" (Booth, 1977). The South Atlantic region faces some of the so-called new "blue crime" threats, being a route for drug and human trafficking, piracy (see Box 3), smuggling, predatory fishing, armed robbery, and transnational organized crime in general (Medeiros et al., 2017). Of particular importance to the study region is IUU, which presents a security issue, fuelled by current unsustainable fishing levels and the destruction of the fishing grounds. A recent surge in migration from West Africa through the perilous Atlantic route has been observed[30], as authorities clamped down on crossings from Libya to Europe.

Addressing these security threats requires concerted action among the countries of the South Atlantic region through proactive diplomacy and cooperative relations. Cooperation around maritime issues in the South Atlantic has evolved, among others, through organizations like South Atlantic Peace and Cooperation Zone (ZOPACAS) and South Atlantic Maritime Area Coordination (CAMAS).

Box 3: West Africa becoming the world's piracy hotspot

A current pressing security issue off the coasts of West Africa is maritime piracy, with the Gulf of Guinea becoming the world's new hotspot for piracy. In 2018, 112 incidents were recorded in the Gulf of Guinea, making it the highest rate of piracy incidents of any region and accounting for about 40 % of all worldwide incidents that year. Figures published by the International Maritime Bureau show a rise in piracy and armed robbery on the world's seas in the first nine months of 2020, with a 40 % increase in the number of kidnappings reported in the Gulf of Guinea, compared with the same period in 2019. This area is the epicenter of maritime crimes linked to petro-piracy – a form of piracy aimed at stealing crude-oil from tankers and pipelines so as to process the gains in illegally set up refineries. Paradoxically, the discovery of large amounts of offshore hydrocarbons has generated poverty rather than wealth, exacerbating social tensions and increased environmental pollution.

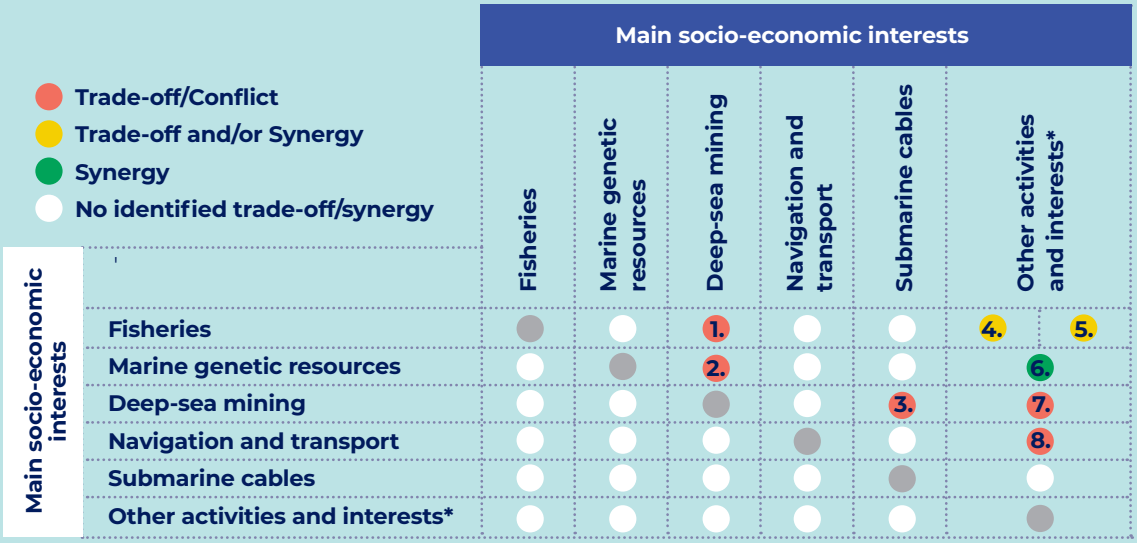
Lack of security leads to lower investments, uncontrolled use of resources putting pressure on the environment. Significant law enforcement capacities, information sharing tools, and effective maritime governance structures are required to address these security issues. International cooperation to combat piracy in the Gulf of Guinea has increased in recent years, with the launch of the Yaounde Process in 2013. Since 2018, the French, Italian and American navies have been carrying out joint military exercises with the naval forces of countries in the Gulf of Guinea, in an attempt to improve their tactics for fighting crime in ABNJ.

Sources: World Economic Forum (2019), Belayachi (2020), ICC – IMB (2020)

[30] https://www.infomigrants.net/en/post/27843/migrants-from-africa-take-more-dangerous-route-to-europe

Box 4: Synergies and trade-offs between activities and interests

The main synergies or trade-offs/conflicts, either by co-existing in the same space or through pressures generated by the activities, are identified.



*Includes marine research, biodiversity management/conservation and maritime security

1. Fishing <-> Deep-sea mining
- ↗ Noise, light, sediment plumes, and contaminants from deep-sea mining activities can threaten both commercial and subsistence fisheries;
- ↗ Can potentially compete for space;

2. Marine genetic resources <-> Deep-sea mining
- ↗ Deep-sea mining places at risk genetic material that could potentially have biotechnical or pharmaceutical use in the future (Levin et al., 2020), due to damaging of resources and habitats;

3. Deep-sea mining <-> Submarine cables
- ↗ Submarine cable companies can potentially conflict or overlap spatially with deep-sea mining;

4. Fisheries <-> Biodiversity management/Conservation
- ↗ Fisheries have been one of the highest stressors for biodiversity through habitat destruction, by-catch of non-target species, overfishing and illegal fishing;
- ↗ An effective method for protecting fisheries resources is through biodiversity management/ conservation using ABMTs, such as marine protected areas;

5. Fisheries <-> Maritime security
- ↗ Sea robbery and piracy present an obstacle to commercial fishing in ABNJ. At the same time maritime security is required to safeguard activities on ABNJ, e.g. fishing, eventual deep-sea mining;

6. Marine generic resources <-> Research
- ↗ Marine scientific research and development may generate samples containing MGR that may be of interest for bioprospecting;

7. Deep-sea mining <-> Biodiversity management/Conservation
- ↗ Deep-sea mining poses a potential risk for biodiversity loss, forced species migrations, and loss of connectivity that could lead to species extinctions in the deep ocean (Van Dover et al., 2017); and

8. Navigation and transport <-> Biodiversity management/Conservation
- ↗ Marine biodiversity is threatened by navigation and transport due to risks of collisions with marine mammals, and air, oil, marine litter, artificial light and underwater noise pollution.

The overview of synergies and trade-offs/conflicts presented above is non-exhaustive. Yet, it highlights the need for integrated multi-sectoral approaches, ocean governance arrangements, cross-sectoral collaboration etc. for managing the sustainable use and conservation of biodiversity in ABNJ. One example tool could be the application of Marine Spatial Planning (MSP) in ABNJ (Ardron et al., 2008). The development of conservation measures and integrated management of activities and interests in ABNJ will be the focus of the upcoming study under the framework of STRONG High Seas project.

4. Characterization of the socio-economic importance of ABNJ in the Southeast Atlantic region

Starting off from the notion that *"Access to ocean resources and sectors is rarely equitably distributed, many of their benefits are accumulated by a few, while most harms from development are borne by the most vulnerable"* (Österblom et al., 2020), this chapter looks into the socio-economic outcomes (costs and benefits) created through the exploitation and conservation of marine biological diversity in ABNJ. The analysis is underpinned by a number of case studies, which identify and characterize the socio-economic outcomes across States and societal groups. At the same time, it encompasses the main elements and principles of a new legally binding instrument for the conservation and sustainable use of marine biological diversity beyond national jurisdiction currently being negotiated (see Box 1).

4.1 Categorization of benefits and costs of the use of natural resources in ABNJ

To the extent possible, the description of benefits and costs is based on the following classification:

i. **Direct/indirect:** Direct benefits and costs are directly associated with the activity, as opposed to indirect benefits and costs that are not directly associated with the activity, i.e. realized as a by-product of the activity

ii. **Tangible/intangible:** Tangibility refers to the ease with which benefits or costs can be readily identified and measured (monetized). When the financial value of a benefit or cost cannot be accurately measured (non-monetized), these are referred to as intangible costs.

iii. **Short/long-term:** Costs incurred and benefits reaped, e.g. within one year, as opposed to benefits and costs achieved in the future

Within the scope of this study, example benefits include increased revenues, local incomes, direct and indirect job opportunities, market access, improved food security etc. Indirect benefits include poverty reduction, provision of alternative livelihoods, higher awareness etc. Costs include operational costs, labour costs, costs of regulations and their enforcement, investments in research and development. Indirect costs include violation of labour rights, unsafe working conditions, damaging social and cultural implications and limited local benefits due to elite capture.

4.2 Reconciling benefits and costs in the context of the Southeast Atlantic region

The reconciliation of the identified benefits and costs in the context of the study region is illustrated through the following case studies below. The selected case studies cover specific topics of key relevance to the main activities and interests in the study region. Aiming to provide a diverse coverage of the activities and interests, most of the featured topics were brought forward during interviews with national stakeholders. To the extent possible, case studies are supported with available data and information.

↗ *CASE STUDY 1: Is fishing in ABNJ economically profitable?*

New technologies make it possible to unravel information on the composition of the global fishing fleet, providing a more accurate picture, previously unattainable, of the efforts and economic rationality of fishing in ABNJ (Sala et al., 2018). In total, a minimum of 3620 unique fishing vessels operating in the ABNJ were identified in 2016, in addition to 35 bunkers that refuel fishing vessels and 154 reefers (refrigerated cargo ships used for transshipment).

The study by Sala et al. (2018) also reveals that fisheries in ABNJ rely heavily on subsidies. Without government subsidies, an estimated 54% of current ABNJ fishing grounds would be unprofitable at current exploitation rates. On aggregate, these subsidies are more than twice the most optimistic estimates of profits. The overview of the economics of ABNJ fisheries at the global scale and in the Southeast Atlantic region (FAO Major Fishing Areas 34 and 47) is presented in Table 4.

Table 4: Overview of the economics of ABNJ fisheries (2014). Source: Sala et al. (2018)

US$ Million	FAO Major Area 34		FAO Major Area 47		Global	
Cost range	280.0	340.9	121.6	134.7	6200	8000
Revenues (landed value of the catch)	309.7		124.6		7600	
Loss/profit range before subsidies	−31.2	−9.8	−10.1	3.0	−364	1400
Loss/profit range after subsidies	368.0	429.95	98.7	111.74	3800	5600
Subsidies	399.2		108.8		4200	

At the global level:

- The total costs of fishing in ABNJ ranged between US$ 6.2 billion and US$ 8.0 billion in 2014, not accounting for capital investments. The main uncertainties stemmed from fuel and labour costs, particularly for China and Taiwan, which exhibited the highest total costs but for which fisheries data are often scarce (Sala et al., 2018);

- The aggregate revenue (landed value of the catch in US$) from fisheries from the ABNJ in 2014 was US$7.6 billion for a total catch 4.4 million metric tons;

- Subtracting the estimated costs from the landed value of catch provides the first empirically-based estimates of the net economic profit of fishing in ABNJ: globally, it was estimated that ABNJ fishing profits (not accounting for subsidies) ranged between −US$ 364 million and +US$ 1.4 billion;

- The estimated net economic profit was far lower than the estimated government subsidies of US$ 4.2 billion in 2014, implying that without subsidies (and low labour costs) ABNJ fishing at the global scale is unprofitable, with most negative returns accrued from China, Taiwan, and Russia. In fact, without subsidies and/or low labour compensation, more than half of the currently fished ABNJ fishing grounds would be unprofitable at present exploitation rates which, for many fish stocks, is already above the sustainability levels;

- ABNJ fishing profits (accounting for subsidies) ranged between US$ 3.8 billion and US$ 5.6 billion. The economic benefits vary enormously between fisheries, countries, and distance from ports; and

- Fishing profits are likely to vary over time as factors, such as fuel price, fish price, climate, and fish stocks, fluctuate.

Focusing on the Southeast Atlantic (FAO Major Fishing Areas 34 and 47), most vessels fishing in ABNJ incurred losses or broke even before accounting for subsidies (Figure 20). In FAO Major Fishing Area 34, the highest profits before subsidies were incurred by Ghana, primarily through purse seine fishing (between US$ 31.7 and 53.6 million). Marginal profits were also registered by Côte d'Ivoire (long line) and Ghana (pole-and-line). Overall profits were lower in FAO Major Fishing Area 47, with the highest profits before subsidies incurred by Japan (US$ 15 million), followed by Namibia (US$ 6 million).

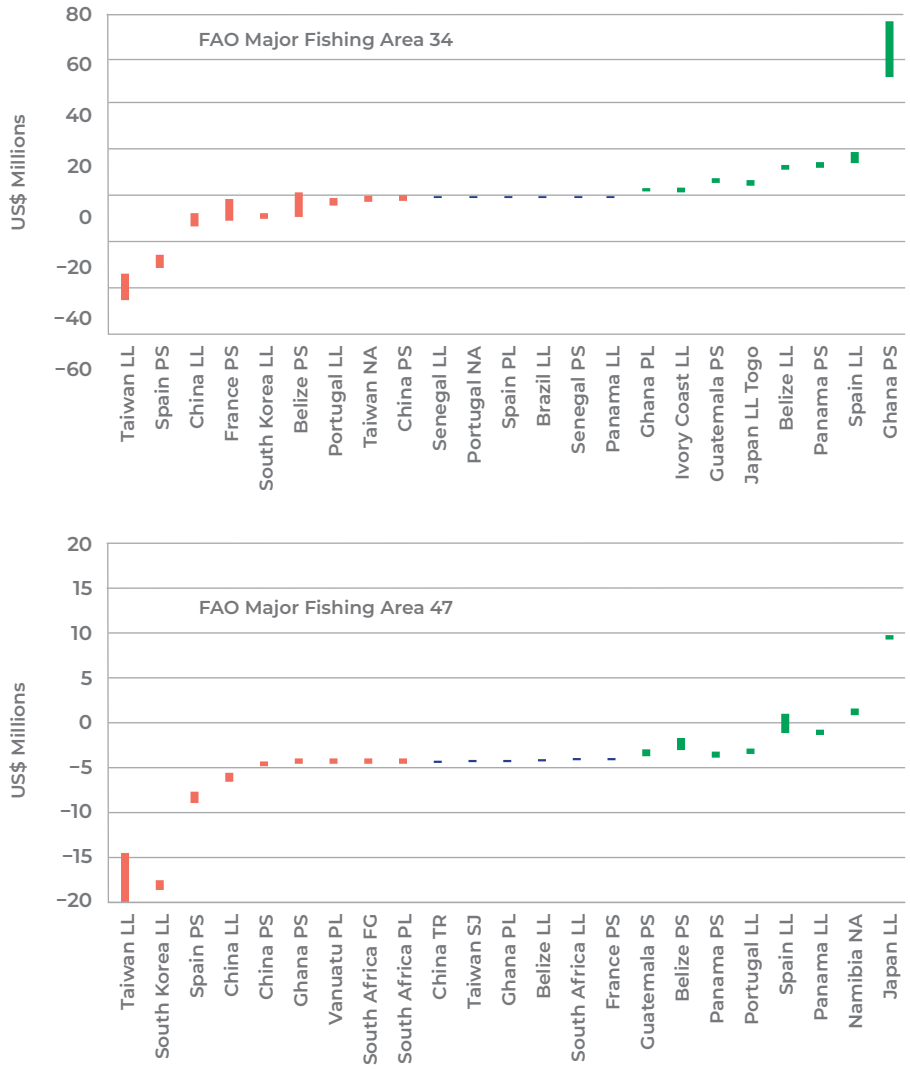


Figure 20: Distribution of profit ranges (US$ Millions) before subsidies for vessels fishing in FAO Major Fishing Areas 34 and 47. Gear types: LL = long line; PL = pole and line; PS = purse seine; SJ = squid jigging; TR = bottom trawling; NA = unknown. Red: loss; blue: break-even; green: profit. | Source: Sala et al. (2018)

With tuna being Ghana's biggest seafood export contributing significantly to its domestic fisheries sector, the country has a substantial stake in the global tuna industry. Ghana (and Côte d'Ivoire) is a hub of both production and export for the area. Processed tuna exported to the EU retail market could capture 74% of the gross profit per tonne. In a study on the socio-economic dynamics of the Ghanaian tuna industry using a value-chain approach, O'Neill et al. (2018) report on a changing organizational structure in tuna production, moving from pole-and-line fishing by smaller companies to large-scale purse-seine fishing backed by consolidated Asian seafood corporations. Purse-seine fishing represents a more efficient and economically-profitable fishing method, with vessels requiring less crew, capable of travelling further distances and with bigger holding facilities. The increasing numbers of purse-seiners replacing smaller bait-boats operating pole-and-line fishing method remove entire shoals of tuna. On most vessels, foreign nationals, mainly from South Korea and occasionally China, served as captains, chief officers, first engineers, boatswains, second officers and second engineers. On the contrary, Ghanaian nationals were mainly crew.

A total of US$ 508 million were received in subsidies for ABNJ fishing in the Southeast Atlantic region in 2016. Heavy subsidies go to FAO Major Fishing Area 34, in particular for Spanish and French vessels which together receive almost 80% of all subsidies for the area, equivalent to US$ 316.4 million. In FAO Major Fishing Area 47, heavy subsidies go to Japan, Spain, followed by South Korea and Taiwan (Figure 21). In contrast, ABNJ fishing by countries in the study region receives limited subsidies (Table 5).

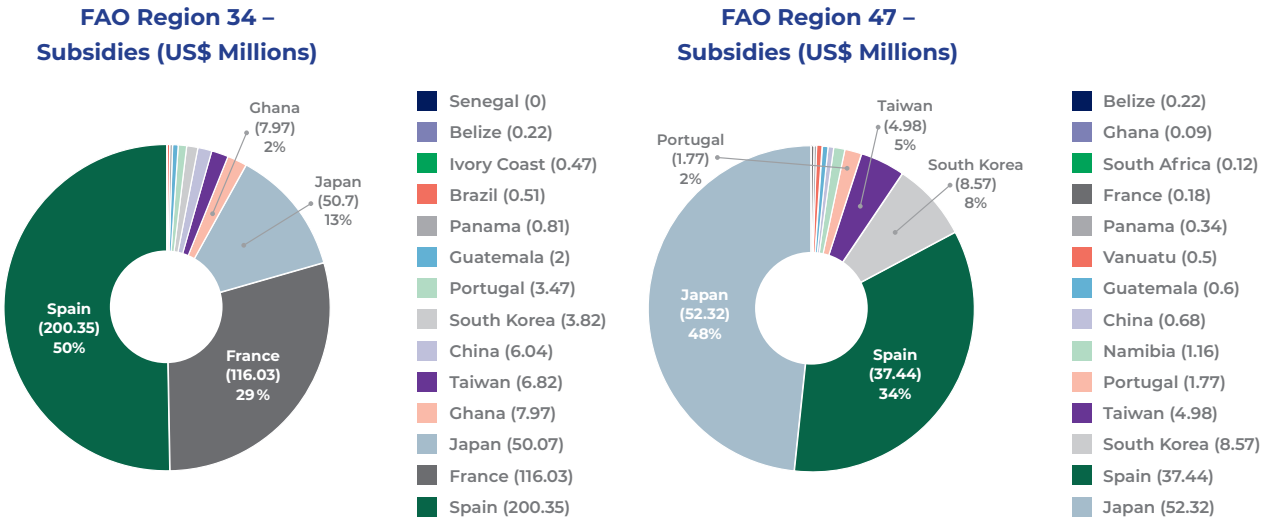


Figure 21: Distribution of subsidies in FAO Major Fishing Areas 34 and 47. Data is for 2016. Source: Sala et al. (2018)

Table 5: Subsidies received by countries in the study region for ABNJ fishing. Source: Sala et al. (2018)

FAO Major Fishing Area 34		FAO Major Fishing Area 47	
Country	***Subsidies (US$ Million)***	***Country***	***Subsidies (US$ Million)***
Senegal	**0**	**Ghana**	**0.09**
Côte d'Ivoire	**0.47**	**South Africa**	**0.12**
Ghana	**7.97**	**Namibia**	**1.16**
Total	**8.44**	**Total**	**1.37**

Subsidies, for example for fuel, received by vessels from governments of highly industrialized countries, enhance the capacities and viability of distant water fishing. At the same time, they enable fishing efforts to persist beyond bio-economic limits, leading to excess fishing capacity, increased competition and reduced profitability per vessel. A low catch value per individual fisher is often compensated by reductions in labour costs, e.g. through lowered wages, non-compliance with labour and safety standards, poor working conditions, and the use of forced or slave labour as a way to cut down costs and prop profits. Transshipments of catch, fuel, supplies and crew in ABNJ are commonplace, allowing fishing vessels to remain at sea for extended periods of time, during which time crew may be unable to disembark. Other ways of reducing expenditures include reliance on fishing far from home and out of reach of enforcement agencies, where regulatory violations may be more likely to go undetected, and fishing illegally to circumvent licensing costs, taxes and catch limits (Tickler et al., 2018).

Key findings	
↗ Information on the composition and activity of the global fishing fleet is potentially becoming more transparent by virtue of new technologies;	
↗ Fisheries in ABNJ heavily rely on subsidies. Without government subsidies, more than half of current ABNJ fishing grounds would be unprofitable at current exploitation rates. Most vessels fishing in ABNJ in the Southeast Atlantic incurred losses or broke even before accounting for subsidies;	
↗ Subsidies, for example for fuel, received by vessels from governments of highly industrialized countries, enable fishing efforts to persist beyond bio-economic limits, leading to excess fishing capacity, increased competition and reduced profitability per vessel;	
↗ A low catch value per individual fisher is often compensated by reductions in labour costs and in some cases in the use of forced labour;	
↗ Other ways of reducing expenditures include fishing in areas out of reach of enforcement agencies and illegal fishing to circumvent licensing costs, taxes and catch limits.	
Overview of benefits and costs	
BENEFITS	**COSTS**
↗ High market value of key species	↗ Labour and fuel costs
↗ Job opportunities	↗ Capital investment, including equipment
	↗ Although vessels from highly industrialized countries benefit from government subsidies, subsidies create an unfair advantage to access ABNJ and allow fishing beyond bio-economic (safe ecological) limits
	↗ Reduction of labour costs at the expense of human health and safety costs
	↗ Limited access by some groups to ABNJ fishing and distribution of benefits
	↗ Depletion of fish stocks, including keystone species
	↗ High occurrence of by-catch
	↗ Disruption of ecosystem functioning; impacts on the overall ecosystem health

The table highlights the main socio-economic outcomes associated with the activities described in the case study, while no direct comparison between costs and benefits should be assumed.

↗ *CASE STUDY 2: Is fishing in ABNJ socially equitable?*

Fishing in the ABNJ is characterized by a polarized labour supply and demand between developed/emerging and developing economies. The rising living standards, employment and wage expectations of industrialized fishing countries have led to shortages of domestic crews. This is generally met by the surplus of domestic and migrant workers from developing countries, who are forced to give in to exploitative employment practices in order to secure a minimal income. Human rights abuses in the industrial fishing sector appear widespread and serious (e.g. Witbooi et al., 2020), with recently documented cases involving workers from the study region (e.g. Lawrence and McSweeney, 2017). Vulnerable workers are exploited to reduce costs, with violations in some instances meeting the definition of modern slavery – human trafficking for forced labour on fishing vessels. Other types of organized crimes in the fisheries sector include drug and arms trafficking, smuggling of humans and fuel, fraud, money laundering. corruption and tax crimes. While the ecological and environmental costs of illegal fishing — such as the threat of species extinction and marine habitat destruction — are well-documented, the human costs of such organized crimes are rarely in the spotlight (Witbooi et al., 2020). Also, the lack of adequate monitoring, control and surveillance, and the growing use of flags of convenience present jurisdictional complexities in the investigation of such crimes.

The global trade of seafood, the world's most widely traded food commodity (Bellmann et al., 2016), is another critical dimension of the implications of labour violations associated with industrial fisheries. Seafood trade involves complex supply chains, often passing through several intermediaries and countries before reaching the consumer markets, including the USA and Europe that rely heavily on seafood imports. The practice of transshipment at sea allows catches of multiple fishing vessels to be combined before landing, giving rise to traceability and transparency issues even before the fish enter the supply chain. Imported fish is often further combined with domestically-caught fish in local markets, making the tracing of fish back to individual vessels impossible. This implies that seafood products consumed in the Global North, directly or indirectly through fish meal, could potentially originate from high slavery-risk producers. The labour issues in industrial fisheries have prompted responses by governments and trading partners (e.g. Thailand-EU), NGOs (e.g. Fair Trade), and major industry–research partnerships, such as the Seafood Business for Ocean Stewardship initiative[31], including banning of transshipments at sea by Regional Fisheries Management Organizations (RFMOs) to better detect and prevent IUU fishing, reduce human trafficking and forced labour in ABNJ. In this respect, the South East Atlantic Fisheries Organization (SEAFO), which only covers the southern part of the Southeast Atlantic region and can adopt binding conservation and management measures on specific species (see Durussel et al., 2018), is the only RFMO that mandated a total ban on transshipment at sea for all vessels in 2006[32] (Ewell et al., 2017). The use of new technologies, such as blockchain ledgers and smart seafood labelling, can also enhance transparency, by lowering the cost of reliable supply chain data and improving traceability along the full supply chain (Hardt et al., 2017).

[31] https://seabos.org/

[32] SEAFO, Conservation Measure 03/06 on an Interim Prohibition of Transshipments at- Sea in the SEAFO Convention Area and to Regulate Transshipments in Port, South East Atlantic Fisheries Organization, Swakopmund, Namibia, 2006.

Key findings	
↗ Human rights abuses in the industrial fishing sector, including human trafficking for forced labour on fishing vessels, drug and arms trafficking, smuggling of humans and fuel, fraud, money laundering, corruption and tax crimes are widespread and serious;	
↗ The lack of traceability and transparency of the global seafood trade, involving complex supply chains and compounded by the practice of transshipment are critical dimensions of the implications of labour violations associated with the industrial fisheries;	
↗ New technologies, such as blockchain ledgers and smart seafood labelling, can help improve transparency including along the full supply chain.	
Overview of benefits and costs	
BENEFITS	**COSTS**
↗ High value trade commodity	↗ Human right abuses and exploitative employment practices
↗ Development of new technologies to increase transparency of supply chain	↗ Organized crime (and their human costs)
	↗ Lack of transparency and traceability of supply chain
	↗ Cost of reliable supply chain data
	↗ Inequitable access to ABNJ fishing and distribution of profits

The table highlights the main socio-economic outcomes associated with the activities described in the case study, while no direct comparison between costs and benefits should be assumed.

↗ *CASE STUDY 3: How illegal offshore crimes impact coastal livelihoods – the case of "Saiko" in Ghana*

Saiko is the local name for illegal fish transshipments in Ghana, where industrial trawlers transfer frozen fish to specially-adapted wooden canoes allowing them to stay out at sea for long periods of time. Transshipments take place in ABNJ and *saiko* fish are landed in Elmina and Apam beaches, rather than in Tema and Takoradi, Ghana's authorized ports. Traditionally, *saiko* used to be a practice whereby canoes would buy the unwanted by-catch of industrial vessels. In recent years, this practice evolved into a lucrative industry which competes directly with local fishers targeting the same resources. Currently, *saiko* has assumed an organized commercial enterprise but remains unauthorized (FCWC, 2019).

In a first comprehensive attempt to quantify the volume and value of fish landed through *saiko*, EJF and Mpoana (2019) estimate that with a capacity of approximately 26 tonnes, an average *saiko* canoe lands in a single trip the equivalent of around 450 artisanal fishing trips. In 2017, around 80 *saiko* canoes landed the equivalent of over 55% of the landings of the entire artisanal sector. Based on an estimated 100 000 metric tonnes of fish landed through *saiko*, 1.5 jobs are generated per 100 metric tonnes of fish caught, as compared to 60 jobs in the artisanal fishing sector for an equivalent fish catch.

The *saiko* industry has expanded rapidly in recent years, coinciding with severe declines in the catches of artisanal fishers. Although flagged to Ghana, over 90% of these vessels are linked to beneficial Chinese owners, operating through Ghanaian 'front' companies to import their vessels and obtain a fishing license. *Saiko* landings are valued at more than US$ 50 million annually, with most of the profits in the hands of few individuals. This comes at the expense of Ghana's artisanal fishing sector and the wider economy since the practice lowers prices on the market, particularly for small pelagic fish, allowing for the landing of unreported catch. *Saiko* consents industrial trawlers to effectively steal

the resources from small-scale fishers, before selling it back to local communities at a profit, leading to considerable inequities in the distribution of benefit flows and power imbalances. It incentivizes industrial trawlers not to reduce their by-catch, targeting species that are in high demand for local consumption and that are already severely depleted, such as the small pelagic stocks e.g. *sardinella*, the key target of the artisanal fishers. In fact, the size of fish landed through *saiko* trade has declined over the years with juveniles now making up a significant proportion of the fish catch, which are harvested before they have had an opportunity to reproduce. This poses serious concerns for the long-term viability of the resource, undermining all efforts to rebuild stocks through measures such as closed seasons.

The main market for fisheries exports is Europe, accounting for ~ 85 % of Ghana's seafood export value in recent years. In 2018, the EU imported 33 574 tonnes of fisheries products from Ghana worth €157.3 million (~ US$ 184 million). The vast majority of these imports involved processed and unprocessed tuna products. Ghana's industrial trawl fleet exports between 2 000 and 3 500 tonnes per year of cuttlefish, octopus and squid, primarily to Portugal, Italy and Spain, worth around €10 million (~US$ 11.7 million). According to the research by Environmental Justice Foundation (2020), industrial trawlers that are authorized to export seafood to the EU have been implicated in the illegal *saiko* trade and other forms of illegal fishing. The exports from the industrial trawl fleet represent less than 10 % of the total seafood trade from Ghana to the EU. Yet, the activities of these vessels are having a disproportionate impact on small-scale fishers, driving the collapse of Ghana's coastal fisheries, demonstrating how ecological connectivity is intrinsically linked to *"economic connectivity"*. West African communities have reported that when illegal fishing is reduced, fish stock increases for the benefits of artisanal fishers, thus creating job opportunities and fostering entrepreneurship (World Bank, 2017). However, this balance is economically challenging to sustain.
Initiatives to fight illegal and organized crimes in fisheries are gaining momentum, both at the national and the global level. Fishers in Ghana can now record and report alleged fishery crimes using a new smartphone app, called Dase (McVeigh, 2020). A similar tool is being developed for use in Liberia, where similar clashes between canoes and industrial trawlers have also been reported. At the global level, the issue of transnational organized crime in fisheries is gaining political commitment, as evidenced by the Copenhagen Declaration Against Organized Crime in the Global Fishing Industry and the Blue Justice Initiative[33] that aims to support developing countries in operationalizing the Ministerial declaration.

Key findings
↗ The lucrative, but socially impactful *saiko* industry, the local name for illegal fish transshipments between industrial trawlers and specially-adapted canoes in Ghana, has expanded rapidly in recent years, coinciding with severe declines in the catches of artisanal fishers;
↗ Although flagged to Ghana, over 90 % of the vessels involved in *saiko* are linked to Chinese owners operating through Ghanaian 'front' companies;
↗ *Saiko* competes directly with the artisanal fishing sector targeting the same resources, causing disproportionate impacts on small-scale fishers and wider economic implications, such as lower market prices;
↗ The *saiko* practice demonstrates the intricate link between the ecological and economic connectivity of artisanal and industrial activities in coastal and offshore areas;
↗ A number of initiatives at the national and the global level are targeting the fight against illegal and organized fishery crimes.

[33] https://bluejustice.org/

Overview of benefits and costs	
BENEFITS	**COSTS**
↗ Lucrative revenues for trawler owners and "front" companies	↗ Landing of unreported catch
↗ Sustains seafood export market	↗ Distorts market prices
	↗ Lower catches for artisanal fishers
	↗ Outcompetes efforts of artisanal fishers

The table highlights the main socio-economic outcomes associated with the activities described in the case study, while no direct comparison between costs and benefits should be assumed.

↗ *CASE STUDY 4: What is the trade balance in fish and fishery products?*

Improved transportation, communications and widespread use of refrigeration have facilitated the vast expansion of fish trade at the global level. An estimated 45% of the world catch is now traded internationally, contributing significantly to economic growth and development. The analysis of trade flows – values, quantities, and prices – between developing and developed countries by Asche et al. (2015) suggests that in terms of quantity, seafood exported from developing to developed countries is close to seafood imported by developing countries from developed countries. Many higher-income seafood-producing countries, including the USA and European countries, export much of the fish produced by their own fisheries and meet their net domestic demand with imports of cheaper seafood products from areas such as Southeast Asia, Russia and Africa. This "quality exchange" implies that higher-income countries export high-quality seafood in exchange for lower quality seafood.

In Africa, Morocco leads as the top exporter with 29% of the total value of fish and fishery products exports, followed by Namibia (15.8%) and South Africa (12.3%). Europe is the top fish export market. While Namibia, South Africa, Senegal and Mauritania have a trade surplus, others, including Angola, Democratic Republic of Congo, Cameroon, Ghana, Côte d'Ivoire and in particular Nigeria experience a trade deficit (Tall, n.d.).

Nigeria is the top fish and fish products importer in the study region, and in Africa as a whole. In terms of volume, it ranks as the world's fourth largest importer after China, Japan and USA; in terms of value, it ranks 23rd. Imports are characterized by high volume but low value, including small pelagic fish (horse mackerel, mackerel and sardinellas), ubiquitous in both urban and rural food markets in Nigeria. Other countries relying on foreign imports are Ghana, Côte d'Ivoire and South Africa (Table 6). However, a substantial part of imports to Ghana and Côte d'Ivoire are through intra-regional trade, namely from Morocco, Namibia and Mauritania.

Table 6: Main fishery importers and suppliers. Source: UN Comtrade

Countries*	Main suppliers[34]	Value (in US$)	% of the imports	% from Africa
Nigeria	USA	75 760 062	12	7
	Chile	68 104 407	11	
	Albania	46 758 433	7	
Ghana	Morocco	43 765 928	36	69
	Namibia	32 760 813	27	
	Spain	6 803 130	6	

Countries*	Main suppliers[34]	Value (in US$)	% of the imports	% from Africa
Côte d'Ivoire	Mauritania	114 609 803	29	60
	Morocco	37 703 715	10	
	Netherlands	35 080 599	9	
South Africa	Thailand	95 858 116	44	5
	India	26 107 567	12	
	China	16 061 425	8	

*Note that only countries from the region for which data is available are included

Nigeria's annual fish demand is estimated at 3.32 million metric tonnes, of which domestic production covers ~1.12 million metric tonnes. This gap in local supply is attributed to the low output from industrial fishing. Local industries cannot afford the vessels, equipment and infrastructure required for intense commercial fishing, particularly in ABNJ. For this reason, local production is primarily through artisanal fishing (69 %) and aquaculture (27 %) (Oluwarore, 2018).

Nigeria has the potential to increase its domestic fish production, in particular through expanding aquaculture, which would generate employment opportunities and promote entrepreneurship. By reducing its dependence on fish imports, it will improve foreign exchange, contribute to its economy and the further growth and development of local trade. Yet this would require investments, reforms and the pre-requisite of sustainably-managed resources.

Despite efforts to boost intra-regional trade, a number of important obstacles remain (Tall, n.d.), including inadequate infrastructure; inefficient cross-border procedures; Rules of Origin; catch certificates; quality and safety issues; IUU fishing aspects and ecolabelling; and lack of investments and private-sector development. An environment that fosters trade facilitation is required, as well as efficient core services, such as financing, telecommunication services, energy and adequate transportation networks.

Key findings
↗ About 45 % of the world catch is traded internationally, characterized by a "quality exchange" between higher- and lower-income countries;
↗ While some countries in the study region have a trade surplus, others experience a trade deficit and need to revert to imports to meet their local demand;
↗ The gap in local fish supply is attributed to the low output from industrial fishing, as a result of a lack of appropriate vessels, equipment and infrastructure;
↗ Low resource capacity of the countries in the study region to invest in industrial offshore fishing results in insufficient supply to attend national demand, the need to import food and consequently fish trade deficit;
↗ An environment that fosters intra-regional trade is required. Among the current obstacles are inadequate infrastructure; inefficient cross-border procedures; Rules of Origin; catch certificates; quality and safety issues; IUU fishing aspects and ecolabelling; lack of investments and private-sector development.

[34] The official country names (followed by short forms in brackets) are: Republic of Chile (Chile), Republic of Albania (Albania), Kingdom of Morocco (Morocco), Kingdom of The Netherlands (Netherlands). The official names of the other countries in the figure have already been specified above. For the sake of brevity, only short forms are used in the text.

Overview of benefits and costs	
BENEFITS	**COSTS**
↗ Increase in fish trade at the global level due to improved transportation, communications and widespread use of refrigeration	↗ Low output from industrial fishing results in gaps in local supply
↗ Increased fish trade contributes significantly to economic growth and development	↗ Lack of vessels, equipment and infrastructure required for intense commercial fishing
↗ Some countries in the study region can cover the local demand and experience trade surplus	↗ Other countries in the study region have limited domestic fish production; dependence on fish imports to meet demand
↗ Export contributes to improved foreign ex change	↗ Imports characterized by high volume but low value
↗ Potential to increase domestic fish production, in through expanding aquaculture, generate employment opportunities and promote entre preneurship	↗ Investments and reforms required to increase local production
↗ Potential for intra-regional trade	

The table highlights the main socio-economic outcomes associated with the activities described in the case study, while no direct comparison between costs and benefits should be assumed.

↗ *CASE STUDY 5: Overfishing decreases food security, reduces income, causes species extinction and disrupts ecosystems*

Although the fishing sector helps meet the increasing demand for fish, create jobs for African citizens and can contribute to lower the cost of fish and seafood, overfishing is having many negative environmental, as well as social and economic consequences. Overfishing is the removal of a species of fish from a body of water at a rate that the species cannot replenish, resulting in those species becoming underpopulated in that area. FAO describes the status of fish stocks across the range from under-, moderately-[35], fully-exploited, overexploited, depleted to recovering. Accordingly, the following definitions are used by FAO:

- ↗ **Fully exploited:** *The fishery is operating at or close to an optimal yield level, with no expected room for further expansion;*
- ↗ **Overexploited:** *The fishery is being exploited at above a level which is believed to be sustainable in the long-term, with no potential room for further expansion and a higher risk of stock depletion/collapse;*
- ↗ **Depleted:** Catches are well below historical levels, irrespective of the amount of fishing effort exerted;
- ↗ **Recovery:** Catches are again increasing after having been depleted.

[35] Under- and moderately- exploited are not discussed here.

Table 7: List of fish stocks classified as either "overexploited," "depleted," or “recovering” in FAO Major Areas 34 and 47. Stock assessments based on 2004 data, catch volumes based on 2002 data. Source: FAO (2018)

Fish	Status	Main fishing countries	Tons/year
FAO Major Fishing Area 34			
Common sole/*Solea solea*	Overexploited	Morocco, Italy	4 000
Various other flatfish/*Pleuronectiformes*	Overexploited	Spain, Senegal, Morocco, Mauritania	25 000
Other flounders, halibut and sole-like fish	Overexploited	Nigeria, Korea, Cameroon, Sierra Leone	3 000
Senegalese hake/*Merluccius senegalensis*	Overexploited	Spain	8 000
Other cods, hakes and haddocks	Overexploited	—	5 000
Bigeye Tuna/*Thunnus obesus*	Overexploited	Spain, China, Taiwan, Japan	44 000
Common Octopus/*Octopus vulgaris*	Overexploited	Spain, Italy	9 000
Various other octopus/*Octopodidae*	Overexploited	Morocco, Senegal, Mauritania	63 000
FAO Major Fishing Area 47			
Cape hakes/*Merluccius capensis/M. paradox*	Fully exploited to overexploited	Namibia, South Africa	306 000
Geelbeck Croaker/*Atractoscion aequidens*	Depleted	South Africa	0
Red Steenbras/*Petrus rupestris*	Depleted	South Africa	0
Kingklip/*Genypterus capensis*	Overexploited	Namibia, South Africa	13 000
Bigeye Tuna/*Thunnus obesus*	Overexploited	China, Taiwan, Japan	19 000
Southern Bluefin Tuna/*Thunnus maccoyii*	Overexploited	Japan, China, Taiwan	42 000
Cunene Horse Mackerel/*Trachurus trecae*	Overexploited	Angola	45 000
Cape Rock Lobster/*Jasus lalandii*	Overexploited or recovering from depletion	South Africa, Namibia	3 000
Southern Spiny Lobster/*Palinurus gilchristi*	Overexploited	South Africa	1 000
Perlemoen Abalone/*Haliotis midae*	Overexploited	South Africa	1 000
Cape Hope Squid/*Loligo reynaudi*	Fully exploited to over exploited	South Africa	7 000

The fish stocks classified as overexploited/depleted/recovering in FAO Major Areas 34 and 47 are presented in Table 7, together with the main fishing countries and the amount of fish caught.

The overexploitation of marine resources has generated a significant decrease in biodiversity, among other types of impacts. This loss in biodiversity has negative consequences on ecosystems as it disrupts the balance of ocean food chains. Overfishing influences the fish assemblage dynamics, which has lasting consequences on the ecosystem. For example, overfishing a large, predatory fish species such as shark will increase the number of species that the shark preys on, such as rays. The increase in the number of rays then results in a decreased amount of their food sources, and so on. The impact of overfishing is critical as it touches thousands of Africans, with ecological “ripple effect” consequences that extend beyond administrative boundaries throughout the ocean ecosystem.
The majority of the fish stocks in West African waters are now in a state of collapse or depletion, with particularly severe consequences for Senegal. According to FAO (2018), 90 % of fisheries in Senegal are fully-fished or facing collapse, including high-value species or coastal demersal, such as lobster, cuttlefish, octopus, shrimp, sea beam, threadfin, sole and grouper. Due to the high demand and market value of these species, the country is encouraged to export to the European market. With more than half of Senegal’s population living below the poverty line and many of them depending on fishing

and related industries for their livelihoods, the depletion of fish stocks has critical social and economic consequences in Senegal. It threatens the household incomes of Senegal's residents in which fisheries play an important role and consequently the economy of Senegal. In addition, the playing field for catching fish is not even as industrial vessels had been frequently spotted in fishing areas six miles off the coast which are considered a zone reserved for small-scale, traditional fishing. Thus, traditional fishermen have been risking their lives by going out to dangerous waters in their pirogues, only suitable for sailing along the coastline due to their small size, in order to compete in what is considered a lost battle against the industrial trawlers. In November 2020, a mysterious skin disease affected a thousand Senegalese fishermen after returning from sea. Although the authorities reassured that there is no risk in relation to the consumption of fish, many fishermen have complained about the poor sales of their products after messages on social networks advising to temporarily refrain from eating fish (AfricaNews, 2020).

The depletion of fish stocks is exacerbating the food crisis in Senegal (Greenpeace, 2017) at a time when climate change is reducing the amount of food grown on land. The depletion of fisheries through overfishing can therefore cause malnutrition and food insecurity, thereby perpetuating poverty. Today, most of the species which are threatened with extinction constitute the main food sources of African citizens in the region. Moreover, in a part of the world where poverty reduction remains an important challenge, preserving the diversity of marine fish species and maintaining good levels of fish stock will help safeguard the livelihoods of local communities.

Several options for sustainable practices exist. First, fishing capacities could be adjusted to sustainable levels through new policies and regulations, including judicious use of targeted incentives. This will therefore require the eradication of subsidies which encourage legal fishing fleets to enter the waters of developing countries, contributing to overfishing. Instead, subsidies could be targeted to help developing countries combat illegal fishing by supporting coastguards and navies. Secondly, regional and global partnerships could be enhanced to facilitate the exchange of management knowledge, as well as to enhance the institutional and governance capacity of developing countries. Thirdly, fish resources could be sustained through the establishment of a trading system for fish products, as well as through the set-up of large-scale marine reserves closed for fishing to enable fish stocks to regenerate. Finally, technologies such as blockchain are providing numerous solutions for the traceability of the seafood industry (e.g. Fishcoin[36]) with cutting-edge tools supported with data that can be trusted, transparent and secure which facilitate a sustainable and responsible consumption. These practices are a step forward to a more sustainable fishing industry. However, it still remains that without an integrative approach which promotes collaboration and synergies with other country-led actions, it will not be sufficient to address the issues before the looming tipping point is reached.

Key findings
↗ Several fish stocks in the study region are overexploited – i.e. being exploited at above a level which is believed to be sustainable in the long-term;
↗ The overexploitation of marine resources, such as through overfishing, does not only have negative environmental impacts, but also social and economic consequences;
↗ Most of the threatened species constitute the main food sources of African citizens in the region, raising concerns about food security and malnutrition;
↗ The selective removal of large predatory species disrupts the ocean ecosystem and food chain, creating a ripple effect that extends beyond administrative boundaries;

[36] https://fishcoin.co/#seafood-industry

Key findings	
↗ Different options for more sustainable fishing practices exist, including the adjustment of fishing capacities to sustainable levels, eradication of subsidies that enable fishing capacities to persist beyond safe-ecological and economic limits, enhancing regional and global partnerships to strengthen the institutional and governance capacities, close large-scale marine reserves for fishing to enable fish stocks to regenerate, and use of new technology to improve the traceability of the seafood industry.	
Overview of benefits and costs	
BENEFITS	**COSTS**
↗ Fisheries provide for income, food security and support livelihoods	↗ Overfishing/overexploitation of marine resources contributes to biodiversity loss
↗ Increasing demand for fish creates job opportunities	↗ Majority of the fish stocks are in a state of collapse or depletion
↗ High market value of fish exports	↗ Depletion of fish stocks exacerbates the food crisis and threatens household incomes
↗ Potential benefits of more sustainable practices: ↗ subsidies could be targeted to combat illegal fishing ↗ better management strategies due to facilitated exchange of knowledge ↗ enhanced trading due to the establishment of a trading system for fish products ↗ fish stock regeneration due to large-scale marine reserves temporarily or permanently closed for fishing	↗ Higher risks assumed by artisanal fishers to fish further offshore due to depleted stocks ↗ Disruption of the ocean ecosystem and food chain, creating a ripple effect that extends beyond administrative boundaries

The table highlights the main socio-economic outcomes associated with the activities described in the case study, while no direct comparison between costs and benefits should be assumed.

↗ *CASE STUDY 6: Blue shark fishing and trading*

Blue Sharks are fished by many countries. Yet, most of the countries do not limit catch, and no international catch limits are enforced to manage their populations. Although sharks are rarely caught with purse seines or pole-and-line-fishing equipment, surface longliners have a catch rate of around 68%, compared to 30% for tuna and swordfish. The blue shark is particularly vulnerable to longline by-catch. The total shark catches are estimated at around 31 000 tonnes a year, of which up to 75% is blue shark (Prionace glauca) (European Commission, 2016). Countries reporting significant catches of Atlantic Blue Shark include (in order of magnitude): Spain, Japan, Portugal, Chinese Taipei, Namibia, Brazil, Ghana, South Africa, Uruguay, and the Republic of Korea (COFI, 2018). In recent years, EU fishing vessels have been responsible for more than 85% of blue shark landings reported from the North Atlantic and more than 75% of total Atlantic Blue Shark landings (2006-2015) (Shark Trust, 2017). Population assessments in the North Atlantic have indicated a strong decline in blue shark populations. In the South Atlantic, the population status and trends are less clear (Barreto et al., 2015). However, convincing evidence showing a decline in pelagic South Atlantic sharks was documented for the first time in 2016, most likely resulting from fleets moving southward from well-monitored to less regulated areas (Micheli and Ferretti, 2016).

The blue shark dominates the shark fin trade. As many as 73 million sharks end up in the global shark fin trade every year (Oceana, n.d.) often subjected to shark finning – the removal of fins from sharks and discarding the rest of the shark back into the ocean. This practice is driven by the discrepancy in value between shark fins and carcasses. Shark fins are among the most expensive seafood products, commonly retailing at US$ 400 per kg. A significant decline in the consumption of shark fins (80%) has been observed in mainland China, as a result of years of public awareness and conservation campaigns and a ban on the consumption of shark fin soup. However, this decline has been offset by new and emerging markets elsewhere, including Hong Kong, Macau and Thailand. New markets for shark meat and liver oil are on the rise, resulting in a 42% increase in global shark meat imports between 2000 and 2011.

As keystone species, sharks play a vital role in the ecosystem and its health, by keeping prey population in check, feeding on diseased fish and thus preventing the spread of disease, and protecting the gene pool. Sharks are particularly vulnerable to fishing due to their low reproductive rates. The International Commission for the Conservation of Atlantic Tunas (ICCAT), which requires fishing nations to report data on and manages by-catches of pelagic sharks, advocates for precautionary measures to prevent overfishing of sharks in cases where the population status is uncertain, and the capping of blue shark catches, particularly in the South Atlantic. The current ICCAT finning ban relies on a fin-to-body weight ratio, which has proven to be complicated for monitoring compliance and enforcement. A number of ICCAT Parties support a "fins-attached" approach requiring that sharks be landed with their fins naturally attached, as is the case in EU, USA, and elsewhere.

Key findings	
↗ The Blue Shark is fished by many countries and is particularly vulnerable to longline by-catch;	
↗ A decline in pelagic South Atlantic sharks was documented for the first time in 2016, most likely resulting from fleets moving from the well-monitored North Atlantic to the less regulated South Atlantic;	
↗ The blue shark dominates the shark fin trade as shark fins are among the most expensive seafood products;	
↗ Although a significant decline in the consumption of shark fins has been observed in mainland China, new markets have emerged elsewhere, including markets for other shark products, such as shark meat and liver oil;	
↗ Measures intended to prevent overfishing of sharks include the "fins-attached" approach and a proposed capping of catches particularly in the South Atlantic.	
Overview of benefits and costs	
BENEFITS	**COSTS**
↗ Decline in the consumption of shark fins as a result of public awareness and conservation campaigns	↗ Strong decline in blue shark populations due to uncontrolled catches for shark fin trade or a by-catch
	↗ Loss of ecosystem functioning, as a result of loss of sharks' vital role in keeping prey population in check and preventing the spread of disease
	↗ Loss of ability of ecosystem to protect gene pool
	↗ Lucrative revenues limited to specific trade parties
	↗ New emerging exclusive markets for shark products (shark meat and liver oil), with benefits limited mainly to the trade markets

The table highlights the main socio-economic outcomes associated with the activities described in the case study, while no direct comparison between costs and benefits should be assumed.

↗ *CASE STUDY 7: Access and Benefit Sharing from MGR – shifting the focus to non-monetary benefits*

Despite a relatively low level of research capacity, legal and technical expertise on MGR in developing countries (Blasiak et al., 2018), their governments have identified MGR from ABNJ as a top priority in the BBNJ negotiations. While it is generally believed that MGR in ABNJ could offer substantial potential profits, the economic value of MGR and potential profitability are still largely unknown (Leary, 2019). This uncertainty is one of the underlying causes of divergence between the Global North and Global South, especially in relation to sharing of potential monetary benefits (Rabone et al., 2019), which as of today remain merely speculative and over-promoted. The time frame to develop MGR is long (10 years or more) and the process is expensive. The significant upfront costs are not a guarantee of the potential future profits from MGR. Diverging perspectives on monetary benefit-sharing options also emerged between the scientific research community, civil society and the private sector (Collins et al., 2020).

In the face of this uncertainty associated to future monetary benefits, the conceptualization of benefit-sharing should be extended to include the merits of non-monetary benefits, in line with the approaches already in place under the Convention of Biological Diversity and Nagoya Protocol. These might include:

- ↗ access to samples, data and knowledge, including the publication and sharing of scientific knowledge and research results;
- ↗ participation, collaboration and international cooperation in marine scientific research;
- ↗ capacity building and technology transfer, including scientific training and access to resources, research infrastructure and technology; and
- ↗ other socio-economic benefits (e.g. research directed to priority needs such as health and security).

Such non-monetary benefits could lay the foundations for more equitable participation by the Global South in efforts to explore and exploit MGR in ABNJ, alleviating the current divide between the availability of MGR (data or samples) in Global South and their accessibility by developing countries. According to the outcomes of interviews with different stakeholder groups (Collins, et al., 2020), "sharing of research results" and "capacity building" were earmarked by the Global South to be "for (the) greatest potential of beneficial impact" from a list of other proposed non-monetary benefit-sharing options.

In the context of a future agreement, the BBNJ agreement could play a role in highlighting the value of non-monetary benefits, capitalizing on the available non-monetary benefit-sharing activities. Drawing on the lessons learned from the Nagoya Protocol, the BBNJ agreement has the potential to enhance research capacities to equip all potential users, including in the Global South, with the necessary knowledge and skills to access and utilize MGR from ABNJ. This includes providing for a framework that strengthens cooperation and raises awareness of existing efforts and initiatives.

Key findings
↗ MGR from ABNJ are considered as a top priority in the BBNJ negotiations by developing countries despite their relatively low level of relevant research capacity, legal and technical expertise;
↗ The development of MGR is a long and expensive process; the economic value and potential profitability are still largely unknown;
↗ Monetary benefit-sharing options are marked by divergences between the Global North and Global South, and between the scientific research community, civil society and the private sector;
↗ Other non-monetary benefits include access to data, marine research and capacity building;
↗ The BBNJ agreement could play a role in highlighting the value of such non-monetary benefits, providing a framework for strengthened cooperation and awareness-raising.

Overview of benefits and costs	
BENEFITS	**COSTS**
↗ Generally believed that potential future monetary profits could be substantial – however highly uncertain	↗ Economic value and potential profitability still largely unknown and speculative
↗ Non-monetary benefits of access to samples, data, knowledge	↗ Limited current research capacity, legal and technical expertise; accessibility not a level playing field
↗ Enhanced participation, collaboration and international cooperation in marine scientific research	↗ Expensive and long development process
↗ Enhance research capacities to access and utilize MGR	↗ Associated risks of significant upfront costs that are not a guarantee of the potential future profits
↗ Opportunities for capacity building and technology transfer	
↗ Sharing of research results	

The table highlights the main socio-economic outcomes associated with the activities described in the case study, while no direct comparison between costs and benefits should be assumed.

↗ *CASE STUDY 8: "Unless and until it can be seen that mining of the international seabed will provide global net benefit, and equitably support the world's poorest and most vulnerable populations, it should not be permitted to proceed" (Deep Sea Conservation Coalition 2020)*

Reconciling the benefits and costs of deep-sea mining requires attributing values to the consequences of such activities, as well as the potential impacts on international seabed ecosystems and associated species. Currently, the quantification of the economic value of the living resources of the international seabed in its undisturbed state, costs of pollution, impacts on ecosystem services, carbon footprint, impacts on commercial, recreational and subsistence fisheries, opportunity costs of alternative uses have not been delivered by contractors.

The ISA is required to provide for the equitable sharing of financial and other economic benefits derived from mining activities in the Area between member States, as part of its mandate to manage seabed mineral activities for the benefit of mankind as a whole. A key element of the ISA's regulations, yet to be agreed, is how financial benefits of deep-sea mining will be gathered through the payment mechanism and how would these be shared. There is a model on the table for putting into place a benefit-sharing royalty regime administered by ISA, which would deliver a form of return to 'humankind'. This could include compensating developing countries that actively mine the same minerals on land if deep-sea mining in ABNJ affects their economies adversely. During the negotiations the member States of the Africa Group voiced their concerns about a regime that would see benefits from mining in the Area flow principally to developed States, or to wealthy shareholders of companies.

Whether such a form of royalty payments provide sufficient compensation for the loss of biodiversity, destruction and degradation of seabed ecosystems, and impacts on the broader marine environment remains an open question. Also, for achieving equitably shared revenues, the royalty regime should account for the intergenerational equity through the partitioning of resources among current and future generations, an important component of sustainability for non-renewable resources. At this stage, the priority should be given to scientific research that enables the economic valuation of seabed ecosystems, to ensure that mining of the international seabed will provide global net benefits and equitably support the world's poorest and most vulnerable populations.

Key findings
↗ Reconciling the benefits and costs of deep-sea mining is hampered by the difficulty to attribute a value to the international seabed ecosystems and associated species;
↗ Though the scientific understanding of the extent of environmental risks is limited, deep-sea mining is expected to cause significant impacts on the marine environment in the form of destruction and degradation of deep seabed ecosystems, ecological disturbance and biodiversity loss, and alteration of adjacent ecosystems. These impacts would in turn result in high costs for society due to reduced ecosystem services.
↗ Part of the mandate of the ISA is to manage seabed mineral activities for the benefit of mankind as a whole;
↗ The translation of the mandate into a fair and equitable benefit-sharing system, one which also accounts for equitable intergenerational partitioning of resources and provides sufficient compensation for the loss of biodiversity, destruction and degradation of seabed ecosystems, and impacts on the broader marine environment, is a challenging endeavour;
↗ More scientific research on the economic valuation of seabed ecosystems is required to develop benefit-sharing system that equitably supports the most vulnerable populations.

Overview of benefits and costs	
BENEFITS	**COSTS**
↗ Materials supply to consumers globally	↗ Exploitation of "virgin" mining grounds, instead of metal supply from circular economy
↗ Overcome potential forecasted shortages from land reserves	↗ License fees
↗ Increased revenue to sponsoring State through taxes and/or royalties	↗ High capital investments
↗ Potential revenue to 'humankind' through royalty payments collected and managed by the ISA	↗ Operating costs, including costs of refining
↗ Possibilities for strengthening the domestic private sector, encouraging foreign investment*	↗ Royalty payments
↗ Job creation and possibilities for training opportunities*	↗ Liability for third-party harm
↗ New technological development and innovations	↗ Costs of compliance with legal regulatory frameworks
↗ Development of scientific knowledge on exploration and impact monitoring	↗ Flow of lucrative revenues principally to developed states or to shareholders of companies, widening inequity gap
↗ Sovereign wealth funds that are used both for long-term investments in infrastructure or socio-economic projects, safeguarding future generations (intergenerational equity)	↗ Loss of ecosystem services, e.g. impact on fisheries
	↗ Monetary compensation for loss of ecosystem services
	↗ Ecological disturbances due to discharge of sediment and chemicals– many of the actual impacts to ecosystems and species and ecosystem services are yet unknown, but assumed to be significant
	↗ Permanent loss of deep-sea ecosystems (and their intrinsic value) due to irreversible damage
	↗ Alteration of adjacent ecosystems

The table highlights the main socio-economic outcomes associated with the activities described in the case study, while no direct comparison between costs and benefits should be assumed.

*Countries in the study region may not benefit equally from these identified positive outcomes

↗ *CASE STUDY 9: Offshore diamond mining in Namibia: do the benefits for a few balance the costs for the rest?*

Although deep-sea mining in ABNJ is still an emerging sector in the Southeast Atlantic, the region is not new to offshore mining. Offshore diamond mining in Namibia began in 2002, triggered by signs of depletion of the onshore deposits. Marine operations now account for almost 75 % of total diamond production in Namibia, with indications that onshore holdings will run out in approximately 15 years (DSM Observer, 2019). The trend marked by a diminishing supply and an expected rising demand, in particular from emerging economies like China and India, made Namibia's offshore deposits all the more commercially valuable. At the same time, the natural diamond market has been faced by the movement towards lab-grown alternatives.

Diamond mining contributes roughly a tenth of Namibia's GDP. The Namibian government is in a 50–50 partnership with De Beers, the world's largest diamond producer. De Beers purchased mining rights for more than 3 000 square miles of the Namibian seafloor in 1991, of which it explored 3% so far (Sieff, 2017). The company currently operates six ships engaged in offshore diamond mining, with plans for a seventh new US$ 468 million offshore diamond mining ship announced in 2019. The vessel, with a capacity to add 500 000 carats of annual production from 2022, is a joint venture between De Beers and the government of Namibia, which is keen to encourage foreign investment (Reuters, 2019). Newer vessels are equipped with hi-tech surveying equipment able to survey the ocean seafloor using a remotely-controlled benthic crawler and dredger that extracts bottom sediments from the most promising areas identified by drones (Sieff, 2017). Sediments are sucked to the ship by a large pipe, crushed, processed and sorted onboard. The leftover sediment is discharged back in the ocean while recovered diamonds are catalogued, packaged and flown onshore by helicopters.

A number of similarities exist between offshore mining for diamonds and the emerging deep-sea mining operations in ABNJ, despite the differences in the scale of operations and nature. As in most proposed deep-sea mining operations, the immediate seafloor is disturbed, and the risk of irreversible damage to this understudied ecosystem is high. According to the DSM Observer, in analogy to the environmental concerns of deep-sea mining, the impact of returned tailings plumes is allegedly poorly understood, and long-term monitoring is technologically and logistically complicated (DSM Observer, 2019), as opposed to the advanced extractive technology that took years to develop. Offshore diamond mining comes with the same arguments for sustainability and social benefits, much like the deep-sea mining industry. Whereas diamond mining has made some Namibians rich, Namibia still remains the world's third most unequal country (see Figure 6) with millions of people untouched by the revenues.

Key findings
↗ Signs of depletion of diamond resources on land have pushed operations offshore in Namibia;
↗ Offshore mining operations use hi-tech vessels and advanced technologies for surveying the seafloor and extracting the minerals;
↗ The environmental impacts of offshore diamond mining are analogous to those of deep-sea mining – disruption of the seafloor, impacts of tailing plumes and irreversible risks to understudied deep-sea ecosystems;
↗ Similarly, equity issues of the social benefits from offshore diamond mining in Namibia are analogous to inequitable approaches for benefit-sharing from deep-sea mining in ABNJ.

Overview of benefits and costs	
BENEFITS	**COSTS**
↗ High market value of precious minerals	↗ Ecological disturbances due to discharge of sediment and benthic habitat destruction
↗ Counteract signs of depletion of onshore supply	↗ Risk of irreversible damage and impacts to understudied ecosystem
↗ Contribution to national GDP; attracting foreign investment	↗ Alteration of adjacent ecosystems
↗ Advanced surveying and extractive technologies	↗ Lucrative revenues principally to a handful, widening inequity gap
	↗ Costs of expensive equipment, including ships

The table highlights the main socio-economic outcomes associated with the activities described in the case study, while no direct comparison between costs and benefits should be assumed.

↗ *CASE STUDY 10: Environmental degradation and erosion as a result of increased levels of port infrastructure hosting ABNJ activities*

One-third of the population of West African countries lives in coastal areas and is highly dependent on coastal habitats for their livelihoods (e.g. ports, fishing and tourism). As a result, the West African coast is a critical part of the region's economy that accounts for 50% of its GDP. Over the past decade, the greater volume of maritime traffic has significantly increased the need for port infrastructure. This is a case in point of how economic activities in ABNJ are intrinsically connected to the socio-economics of coastal areas. For instance, the growth in the volume of West Africa's container trade has exceeded that of any other global region—doubling to almost 5 million twenty-foot equivalent units (TEUs) (Table 8). This expansion, fuelled by rising incomes in the region, is also contributing to increased congestion at its ports, further exacerbated by a lack of deep-water berths to handle more efficient, larger ships.

Table 8: Container volume growth (TEU) of selected ports in West Africa

Port	Pays	2006	2015
San Pedro	Côte d'Ivoire	49 800	286 516
Tin Can Island	Nigeria	210 002	891 638
Lomé	Togo	215 892	821 639
Monrovia	Liberia	36 500	98 000
Cotonou	Benin	140 500	288 000
Conakry	Guinea	85 300	160 000
Tema	Ghana	425 408	893 841
Abidjan	Côte d'Ivoire	375 876	650 000
Freetown	Sierra Leone	35 600	46 427
Onne	Nigeria	86 290	98 516
Apapa	Nigeria	356 000	402 545
Takoradi	Ghana	51 000	48 622
Dakar	Senegal	375 876	300 000

Source: U.S. International Trade Commission (USITC), May 2018

A recent study of the coastline changes adjacent to 130 African seaports (de Boer et al., 2019) has demonstrated that the construction of the seaports induces significant alterations (Figure 22): breakwater structures and access channels interrupt the alongshore sediment transport and the littoral drift leading to major accretion up-drift and erosion down-drift of the breakwaters. West Africa coastal dynamics are governed by persistent swell waves that induce a strong littoral drift that transports the sediments along the coast from west to east (Giardino et al., 2018). West African coastal areas are hotspots in terms of coastline changes and have experienced severe coastal erosion (up to 23–30 m/year) for many years, leading to significant social and economic costs for the impacted countries. Coastal degradation is responsible for the death of 13 000 people/year, mainly because of flooding events, air and water pollution. The costs of coastal erosion for Benin, Côte d'Ivoire, Senegal and Togo have been estimated to be US$ 3.8 billion or 5.3% of the four countries' GDP (Croitoru et al., 2019). Past studies have estimated the cost for coastal protection in the region to be US$1.5 billion. Considering the above, strengthening the resilience of the coastline is a financial and social urgency to avoid further impacts: investing in coastal adaptation now will reduce the damage, save billions of dollars in the future and protect the livelihoods of the coastal population.

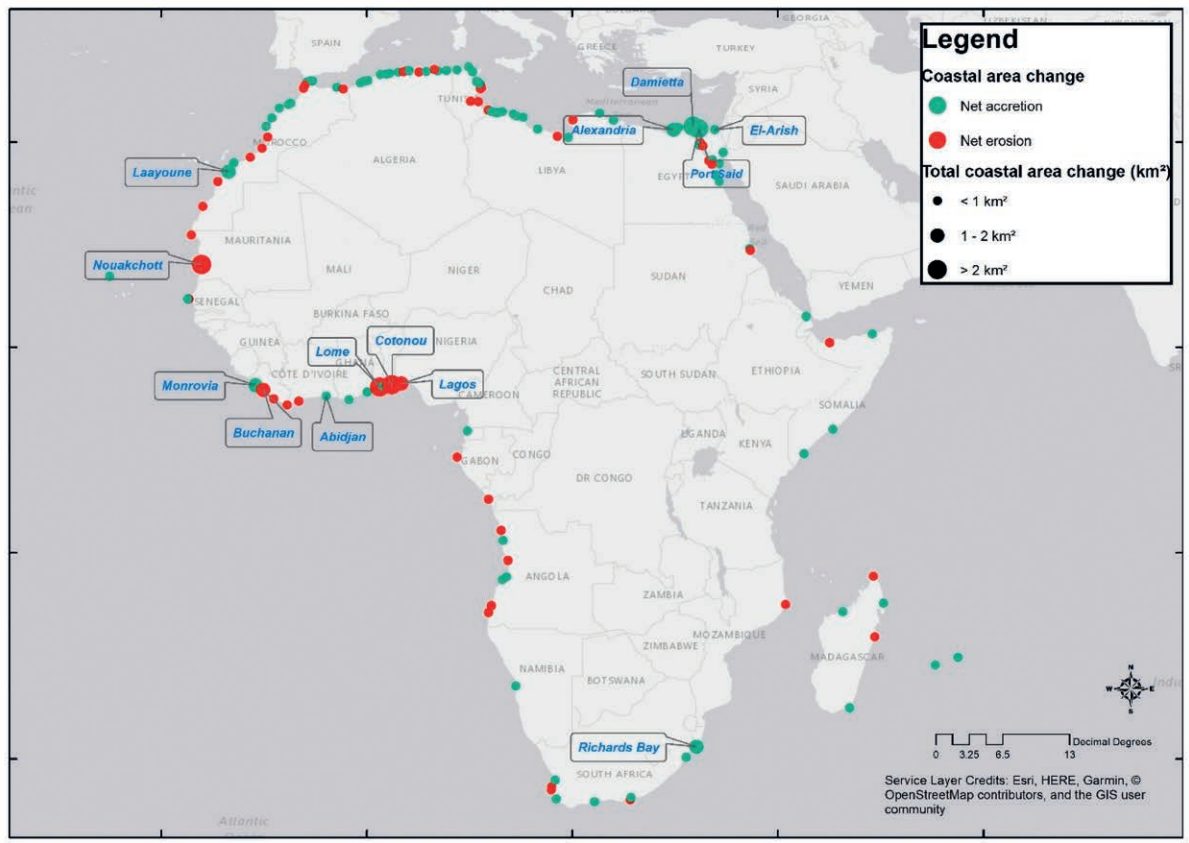


Figure 22: Beach changes around 130 African seaports. Hotspots indicated by text labels. Source: de Boer et al. (2019)

For most ports, the adjacent coastline changes result into two major problems: i. sedimentation of the port access channels and basins, which increase the demand for maintenance dredging and associated costs, and ii. coastal erosion puts the communities down-drift of the ports and their livelihoods at risk. A specific challenge of the coastal management in this region is that the port structures in one country can affect the coastline in the adjacent countries. Hence, coastal erosion is an issue that cannot be solved by one country alone but should be tackled regionally, implying that cooperation between the countries is required to implement integral transnational solutions.

Rising maritime traffic volumes at some of West Africa's ports requires higher investments to improve infrastructure that is approaching capacity limit. Resulting operational delays and inefficiencies significantly increase trade costs. To avoid this, countries seek major investment to build port infrastructure. For instance, Lomé completed the first deep water terminal in the region in 2015, but other ports are currently too shallow and lack sufficient warehousing space and cranes to load and unload the higher number of containers transported by larger ships. As West Africa's current ports expand operations to meet the demands of international shipping companies, they also build deep water terminals to better process larger, more efficient ships but create more pressure on the environment, leading to further erosion and degradation.

Since 2000, investment efforts and policy changes have led to a changing port management landscape. Many ports have invested improving the capacity of their port infrastructure as well as turning to a handful of foreign terminal operating companies to improve their handling efficiency. Most West African ports have undergone institutional reforms with increasing public-private partnerships (PPPs) dominated by multinational operators, resulting in improved operational efficiency of the terminals. This increased share of PPP has also shifted the governance of the ports from state to non-State sectors. Multinational operators have brought along their global environmental practices so that ports' environmental policy can be aligned to international standards. A lack of cooperation and coordination persists in tackling coastal changes due to port infrastructure, a problem leading to increased maintenance dredging costs, flooding risks and other negative impacts for populations, in particular the most vulnerable ones.

Key findings
↗ Maritime traffic volumes and container trade at some of West Africa's ports have significantly grown in the last years, contributing to increased congestion at ports;
↗ The construction of new port infrastructure induces significant alterations along the coastal areas and leads to severe coastal erosion, including in neighbouring countries;
↗ Strengthening the resilience of the coastline is a financial and social urgency to avoid further impacts and, in some cases needs to be done transnationally;
↗ A lack of regional cooperation and coordination persists in tackling coastal changes due to port infrastructure;
↗ Higher investment efforts and policy changes are needed to meet the demands of international shipping companies, and build deep water terminals to better process larger, more efficient ships. Investing in coastal adaptation now will lead to benefits in the future, including the protection of the livelihoods of coastal populations

Overview of benefits and costs	
BENEFITS	**COSTS**
↗ Port construction and operation generate jobs	↗ Greater volume of maritime traffic leads to increased congestion at ports and higher risks of accidental pollution events
↗ Economic development resulting from greater volumes of maritime traffic	↗ High investments required to upgrade infrastructure approaching capacity limits and improve port handling efficiency
↗ Improved operational efficiency of ports, as a result of institutional reforms	↗ Construction of the seaports induces significant coastal alterations
↗ Increasing public-private partnerships (PPPs) dominated by multinational operators; alignment to ports' environmental policy to international standards	↗ Social and economic costs associated with coastal erosion
↗ Development of appropriate infrastructure, such as deep-water berths that can handle more efficient and larger ships	↗ Costs for coastal protection and for increasing resilience, to counteract coastal erosion and associated risks, e.g. flooding

The table highlights the main socio-economic outcomes associated with the activities described in the case study, while no direct comparison between costs and benefits should be assumed.

5. Key findings and outlook

5.1. Building back better: blue recovery

The year 2020 will be remembered as the "year when everything changed" (The Economist, 2020), in the face of the COVID-19 global pandemic and crisis. The impact of COVID-19 on more familiar sectors, such as tourism, aviation, entertainment, food and beverage, and retail industries has repeatedly hit the headlines. However, blue economy sectors have also been hard-hit, as almost no facet of the global economy has been spared from turndown. Emerging data for 2020 show that global maritime trade is expected to plunge by 4.1% in 2020 (UNCTAD, 2020b), shipping activity slowed down, including devastating impacts on the cruise industry, with a projected loss of US$1.9 billion for international shipping carriers alone (Northrop et al., 2020a). The pandemic also triggered a decline in fishing activity by as much as 80% in West Africa (Teleki, McCauley, and Thienemann, 2020).

On the one hand, the global slowdown of the commercial fishing industry impacted negatively the livelihood of those relying heavily on fisheries, in particular developing countries that are vulnerable to disruptions in the entire fisheries supply chain. However, this unforeseen pause in fishing provides a window for living ocean resources to flourish. In a similar way, the reduction in shipping activity allows for quiescent vessels to be fitted with upgrades to increase fuel efficiency and reduce emissions (Northrop et al., 2020a).

COVID-19 presents an opportunity for "building back better", i.e. to implement recovery policies that go beyond getting the economies and livelihoods quickly back on their feet but that trigger investment and behavioural changes aimed at reducing the likelihood of future shocks and increasing society's resilience (OECD, 2020). In the context of the blue economy, the post-COVID-19 era should aim for a sustainable and equitable Blue Recovery (Northrop et al. 2020b) – one that capitalizes on the role of ocean-based solutions in supporting recovery and fast tracks the building a more sustainable blue economy that does not come at the expense of the environment, particularly as countries attempt to boost their economic recovery. Northrop et al. (2020b) propose a set of five priority opportunities for governments to consider for the immediate investment of 'blue stimulus' funds to support the delivery of short-term economic, social (health) and environmental benefits for affected communities and sectors, while building longer-term social, economic and ecological resilience.

The COVID-19 pandemic also disrupted the course of the final stage of negotiations of the BBNJ agreement, as the final intergovernmental conference planned in early 2020 to conclude the agreement was postponed. The postponement of the negotiations prompted multiple efforts aimed at keeping momentum and at securing the successful ratification of this historical agreement after almost two decades in the making.

5.2 Interdependencies between conservation and sustainable use of marine biological diversity in ABNJ and achievement of SDGs

Of particular importance to the socio-economic activities in ABNJ are the Sustainable Development Goals (SDGs) adopted as part of the United Nations Agenda 2030. SGD 14 "Conserve and sustainably use the oceans, seas and marine resources for sustainable development" addresses specifically life underwater through its ten targets (Table 9) and associated indicators that provide a global reference governance framework for managing the oceans. SDG 14 builds on different existing commitments and goals such as the Johannesburg Plan of Implementation (for example, target 14.4 on sustainable fisheries), the Convention on Biodiversity Diversity Aichi Targets (for example, target 14.5 on protection of marine and coastal areas), and coincides with the mandate of the Abidjan Convention and other regional seas'. The ten SDG 14 targets are inter-

related through synergistic interdependencies, depicting complex interactions between the social, environmental and economic dimensions. Given the ocean's central role for biodiversity and climate regulation, SDG14 is essential for the achievement of other environmental (e.g. SDG 12, 13) and socio-economic SDGs (e.g. SDG 1, 2, 3, 4, 5, 8 and 10), as shown in Table 9.

Table 9: Links between socio-economic interests in ABNJ and SDGs

Ecosystem service	Socio-economic interests	Link to SDG 14 targets	Links to other SDGs	Implications for conservation and sustainable use of ABNJ
Provisioning (biotic)	**Fisheries**	↗ 14.4 Restore fish stocks, end IUU and destructive fishing practices ↗ 14.6 End perverse fish subsidies ↗ 14.7 Benefits for small island developing States (SIDS) and least developed countries (LDCs) ↗ 14.b Access for small-scale artisanal fishers to marine resources and markets value chain	↗ SDG 1 No poverty ↗ SDG 2 Zero hunger ↗ SDG 8 Decent work and economic growth ↗ SDG 10 Reduced inequalities ↗ SDG 12 Sustainable consumption and production ↗ SDG 17 Partnerships for the Goals – Trade 	↗ Promote sustainable fisheries management as a key food source, securing food security and coastal livelihoods that rely directly on fisheries ↗ Ensure decent working conditions and respect of labour rights ↗ Ensure that benefits from ABNJ resources are equitably accessed and shared ↗ Increase supply to cover national demands and boost exports through sustainable fisheries management

Ecosystem service	Socio-economic interests	Link to SDG 14 targets	Links to other SDGs	Implications for conservation and sustainable use of ABNJ
	Marine genetic resources	↗ 14.a Scientific knowledge and technology transfer	↗ SDG 3 Good health and well-being ↗ SDG 4 Quality education ↗ SDG 10 Reduced inequalities ↗ SDG 16 Peace, justice and strong institutions 	↗ Increase scientific knowledge, develop research capacity and transfer marine technology ↗ Enable the discovery of new vaccines and drugs from marine species ↗ Ensure that benefits from ABNJ marine genetic resources are equitably accessed and shared
Provisioning (abiotic; ecosystem-state independent)	**Deep-sea mining**	↗ 14.1 Prevent marine pollution	↗ SDG 3 Good health and well being ↗ SDG 9 Industry. innovation and infrastructure ↗ SDG 10 Reduced inequalities ↗ SDG 12 Sustainable consumption and production 	↗ Ensure that benefits from ABNJ resources are equitably accessed and shared ↗ Shift towards production processes that protect and restore ocean health ↗ Reduce and ultimately eliminate waste streams that enter marine ecosystems ↗ Apply precautionary approach in the management of activities that pose environmental risks

Ecosystem service	Socio-economic interests	Link to SDG 14 targets	Links to other SDGs	Implications for conservation and sustainable use of ABNJ
Supporting	**Biodiversity** **Habitat for species**	↗ 14.2 Management of coastal and marine ecosystems ↗ 14.5 Area-based conservation measures	↗ SDG 1 No poverty ↗ SDG 2 Zero hunger ↗ SDG 13 Climate action ↗ SDG 15 Life on land 	↗ Apply ecosystem-based approach to the management of ABNJ ↗ Apply ABMTs to ABNJ to sustainably manage and conserve marine biodiversity and ecosystems and safeguard ecosystem services (provisioning, regulatory and support) to achieve SDG 1 and 2. Note that SDG 14.2.1 and SDG 14.5.1 indicator refer to national EEZ
Cultural	**Research and education**	↗ 14.a Scientific knowledge and technology transfer	↗ SDG 4 Quality education ↗ SDG 5 Gender equality ↗ SDG 10 Reduced inequalities ↗ SDG 16 Peace, justice and strong institutions ↗ SDG 17 Partnerships for the Goals – Capacity building 	↗ Enhance international support for implementing effective and targeted capacity-building in developing countries, including through North-South, South-South and triangular cooperation ↗ Improve coordination among existing mechanisms through facilitation of marine technology transfer ↗ Encourage gender equity through dedicated efforts to increase opportunities for qualified women from developing states to participate in marine scientific research programmes ↗ Recognizing that oceans are the most globally shared natural resource, foster integrated actions across sectors and boundaries

Ecosystem service	Socio-economic interests	Link to SDG 14 targets	Links to other SDGs	Implications for conservation and sustainable use of ABNJ
	Recreation. leisure and tourism	↗ 14.2 Management of coastal and marine ecosystems ↗ 14.5 Area-based conservation measures	↗ SDG 3 Good health and well being ↗ SDG 8 Decent work and economic growth 	↗ Ensure the sustainability of wildlife-based marine tourism, its conservation and socio-economic benefits
Regulating and maintenance	**Waste disposal**	↗ 14.1 Prevent marine pollution	↗ SDG 3 Good health and well being ↗ SDG 9 Industry, innovation and infrastructure ↗ SDG 12 Sustainable consumption and production 	↗ Reduce and ultimately eliminate waste streams that enter marine ecosystems
	Climate regulation **Carbon sequestration and storage**	↗ 14.3 Minimize ocean acidification	↗ SDG 2 Zero hunger ↗ SDG 3 Good health and well being ↗ SDG 13 Climate action 	↗ Recognizing the ocean's critical role in the earth's carbon cycle and climate regulation, and intrinsic linkages to biodiversity

Ecosystem service	Socio-economic interests	Link to SDG 14 targets	Links to other SDGs	Implications for conservation and sustainable use of ABNJ
Other (ecosystem-state independent)	**Navigation and transport/ shipping**	↗ 14.1 Reduce marine pollution	↗ SDG 9 Industry, innovation and infrastructure ↗ SDG 13 Climate action 	↗ Implement measures to lower greenhouse gas emissions from shipping ↗ Implement measures to prevent discharge from ships; oil, sewage, plastic, ballast waters
	Submarine cables/tele-communication	↗ 14.1 Reduce marine pollution	↗ SDG 9 Industry, innovation and infrastructure ↗ SDG 12 Responsible consumption and production ↗ SDG 17 Partnerships for the Goals – Technology 	↗ Enhance North-South, South-South and triangular regional and international cooperation ↗ Access to science, technology and innovation ↗ Enhance the use of enabling technology, in particular information and communications technology
	Maritime security	↗ 14.4 Restore fish stocks, end IUU and destructive fishing practices	↗ SDG 8 Decent work and economic growth ↗ SDG 16. Peace, justice and strong institutions 	↗ Reinforce maritime security to monitor and prevent blue crimes, in particular IUU which is considered a key security issue in the region

5.3 Summary of key findings

Currently, most countries in the study region have limited capacity to access and explore the ABNJ adjacent to their territorial waters. In general, ABNJ is considered "out of reach" and inaccessible. The overview of socio-economic interests shows that currently the key activities in ABNJ relate primarily to fishing, navigation and transport, submarine cables and maritime security. There is a keen interest for the exploitation of MGR and of mining; yet these are considered as emerging sectors for the future.

Declining fish stocks in EEZ are creating the need for fishers to move their activities further offshore. Yet, most countries do not have the required fishing fleets to operate in ABNJ, resulting in insufficient local supply to meet national demands. For this reason, some countries rely on foreign fish imports despite being located adjacent to a major fishing resource. Countries benefitting from fishing revenues from ABNJ in the study region (FAO Major Fishing Areas 34 and 47) include Ghana, Japan, Taiwan, France and Spain. The in-depth analysis of the economics of ABNJ fisheries shows that although fishing profits vary over time due to factors such as fuel price, fish price, climate, and fish stocks fluctuations, more than half of the currently fished ABNJ fishing grounds would be unprofitable at present exploitation rates without subsidies and/or low labour compensation.

When it comes to deep-sea mining, exploration operations are advancing in other areas of the world, even though the scientific understanding of the environmental risks, the extent of risk, destruction and degradation of deep seabed ecosystems, biodiversity loss, and other impacts is still very limited. This has prompted increasing calls by environmental advocacy groups, intergovernmental organizations and non-governmental organizations for an urgent moratorium on deep-sea mining. Many countries in the study region still exploit land mining operations, and therefore they do not (yet) consider moving offshore with imminent urgency. This would require significant investments in equipment and capacities.

The current lack of supporting evidence on the nature and scale of the commercial value in MGR means that the commercial potential of MGR from ABNJ is largely still speculative. The potential for commercialization of MGR is in the hands of a few distinguished "keystone actors" stemming from the world's most highly industrialized countries. MGR is one of the four elements being negotiated under the BBNJ "package deal" and is of high priority to developing countries due to the potential prospects of generating monetary, as well as important non-monetary benefits through increased collaboration on marine scientific research, access to data and information, and transfer of knowledge, capacities and marine technologies.

The characterization of socio-economic interests also highlights the valuation of the regulatory services provided by ABNJ, e.g. climate regulation and carbon sequestration, and their importance to ensure the sustainability of other services, in particular the biotic provisioning sectors. The supporting services provided by biodiversity and habitats in ABNJ lie at the core of the other activities that either depend directly on them, or directly/indirectly impact the state of the ocean ecosystem. In light of the limited means for exploiting the ABNJ, high interest for the conservation of the ABNJ biodiversity was expressed by some interviewees from the study region, advocating for the common heritage of mankind against the freedom the seas more pushed by developed countries. Despite the current low levels of activities in the region, the discussion on the management of ABNJ is timely as it allows the countries to identify the future needs and challenges to be able to balance conservation and sustainable exploitation in the context of the ongoing BBNJ negotiations. As shown by the analysis, the implications of the connectivity between activities in ABNJ and the adjacent EEZs are not only oceanographic and ecological, but also socio-economical with evidence that livelihoods of coastal populations can be severely impacted by ABNJ activities. For this reason, discussions on the management of ABNJ are complementary to the mandate and actions under the Abidjan Convention.

Region-specific studies that highlight the socio-economic importance of conserving and exploiting ABNJ are lacking. An urgent need to increase the knowledge on the ABNJ in the study region (e.g. through enhancing monitoring and observations infrastructure, enhancing understanding of the connectivity etc.) was identified by the countries, claiming that being a relatively new topic, they are generally not aware of the existing and future potential at hand. The BBNJ agreement will facilitate capacity building, knowledge transfer, research and cooperation which will help the region move on from the current phase of awareness-raising to a more comprehensive understanding of the benefits and costs of ABNJ.

The main socio-economic outcomes at the global level and specific to the study region under the "business-as-usual" conditions are identified in Table 10. Other potential positive outcomes through ocean governance (including the BBNJ agreement) that would result from a combination of legal provisions adopted by the BBNJ agreement alongside ones adopted and/or implemented under other global or regional and sectoral organizations are also included. An enhanced relationship among these frameworks will be crucial to confer the sustainable management of natural resources in ABNJ.

Table 10: Overview of actual and potential socio-economic outcomes on ecosystem services

Ecosystem service	Socio-economic interests	Business as Usual with respect to socio-economic interest		Potential positive outcomes through ocean governance (incl. BBNJ agreement)
		Socio-economic outcomes at the global level	Socio-economic outcomes specific to the study region	
Consumptive activities				
Provisioning (biotic)	**Fisheries**	↗ Source of income, employment and protein for a part of the global population ↗ Inequitable exploitation – most of ABNJ fisheries harvest and revenues go to wealthy countries ↗ Ecosystem degradation due to overfishing, including effects of overfishing in EEZ ↗ Loss of resilience of ecosystems from the removal of key species and ecosystem degradation leading to broader impacts on ecosystem services ↗ Inefficient exploitation resulting from market distortions – more than half of the currently targeted fishing grounds in ABNJ would be unprofitable at present exploitation rates and without subsidies and/or low labour compensation ↗ Socio-economic (including human rights) impacts of crimes, including IUU and drug trafficking perpetuates along the value chain	↗ Limited source of income and employment for the population in the study region. 1.2% of the global revenues from ABNJ fisheries go to the countries in the study region ↗ Limited source of protein for the population in the study region ↗ Limited means (vessels, fuel, and equipment) to access ABNJ. 5 out of 22 countries in the study region are active in ABNJ ↗ Ecosystem degradation (including in EEZ) due to overfishing in ABNJ leading to broader impacts on ecosystem services ↗ IUU fishing is a major issue in the study region, motivated by lack of enforcement of MCS; low chance of being detected and low penalties if arrested; high economic benefits associated with catching of high-value species; and the increasing global market demand for valuable species, such as tuna	↗ Improved coordination in decision-making between the BBNJ agreement and fisheries regulatory frameworks with a view to achieving global marine biodiversity conservation goals ↗ Integrated, multisector area management approach within ABNJ ↗ Increased food security resulting from the application of sustainable fishing practices ↗ Re-enforced MCS mechanisms to underpin governance efforts ↗ The adoption of global principles and approaches (e.g. precautionary and the ecosystem principles and the integrated approach) that should underpin fisheries activities in the high seas ↗ Enhanced scientific coordination to address BBNJ and fisheries management matters ↗ Adoption and application of global standards for EIA, including on fisheries activities that impact biodiversity ↗ Acknowledgement of the critical relevance to assess 'cumulative impact' and 'transboundary impact' when developing EIA for fisheries in ABNJ ↗ Identification and assessment of impacts of activities in ABNJ underpinned by the best available scientific information

Ecosystem service	Socio-economic interests	Business as Usual with respect to socio-economic interest		Potential positive outcomes through ocean governance (incl. BBNJ agreement)
		Socio-economic outcomes at the global level	Socio-economic outcomes specific to the study region	
Consumptive activities				
Provisioning (biotic)	**Fisheries**			↗ Countries implement procedures for the prevention, mitigation and management of potential adverse effects of fisheries activities in ABNJ ↗ Stronger multidisciplinary scientific advice to manage BBNJ
	Marine Genetic Resources	↗ Discovery of new vaccines and other medicines from marine species ↗ Growing commercial interest in MGR, reflected in the increase in registration of patent claims involving MGR ↗ Registration of patents dominated by keystone actors: 84% of all patents registered by 221 solo companies mainly located in the Global North- Europe and USA; 47% by a single transnational key actor – BASF ↗ Lack of supporting evidence on the nature and scale of the commercial interest in MGR he commercialization potential of MGR from ABNJ is largely still speculative ↗ Upfront costs in generating capacities and access to MGR with potentially long return and risk on investment ↗ Uncertainties associated with future monetary benefits ↗ Merits of non-monetary benefits, e.g. access to data, samples; participation in collaboration research; progress of human knowledge and better understanding of the natural environment	↗ Comparatively low level of research capacity, research infrastructure, legal and technical expertise on MGR in the study region ↗ Limited opportunities to access and utilize MGR; risk of exclusion from access to MGR driven by patents and private enterprises in wealthy countries ↗ MGR from ABNJ, including access and benefit-sharing, are amongst top priorities in the BBNJ negotiations for most countries in the study region ↗ The global negotiations offer a timely opportunity to be involved in the discussion on potential benefits	↗ Fair and equitable sharing of benefits arising from the utilization of marine genetic resources ↗ Enhanced capacity building opportunities for developing States to access and utilize marine genetic resources ↗ Enhanced generation of knowledge and technological innovations ↗ Development and transfer of marine technology is subject to all legitimate interests, including the rights and duties of holders, suppliers and recipients of marine technology ↗ Increased collaboration on marine scientific research ↗ New instruments on intellectual property rights and the public domain approach; benefit-sharing obligations; and the building of common pools of resource ↗ Clearing House Mechanism for scientific data access and the establishment of a “track and trace”* mechanism

(*a monitoring approach that needs to ‘prove’ the chain of custody of a genetic resource from the point of access – through to the hands of subsequent users in order to have a legal right to the share of benefits.)

Ecosystem service	Socio-economic interests	Business as Usual with respect to socio-economic interest		Potential positive outcomes through ocean governance (incl. BBNJ agreement)
		Socio-economic outcomes at the global level	Socio-economic outcomes specific to the study region	
Consumptive activities				
Provisioning (abiotic; ecosystem-state independent)	**Deep-sea mining**	↗ Economic benefits for sponsoring States and companies ↗ Job creation and economic growth for States involved in the sector ↗ Unequal access and capacities to exploit benefits from deep-sea mining – higher access for wealthy countries and individual companies of the Global North enlarges the economic divide ↗ Irreversible impacts on biodiversity; for instance, scraping the seafloor by machines may alter or destroy deep-sea habitats, leading to a loss of species and ecosystem functions. Yet the extent of impacts on the environment is largely unknown ↗ Negative impact on ecotourism and future development opportunities, as polluting activities may alter, destroy and disturb the marine environment and megafauna, e.g. dolphins, sharks or whales ↗ Potential exposure to liability of the sponsoring State under international law for environmental harm ↗ Difficulty to attribute a value to the international deep-sea ecosystems and associated species; difficulty to agree on equitably shared revenues accounting for the intergenerational equity ↗ Lack of an appropriate framework for EIA on the water column and surface may generate important ecological risks, considering the importance of ecological connectivity for regional countries. ↗ Hinders efforts towards potential reuse and recycling of resources ↗ Uncertainties related to the new uses of materials and their socio-economic consequences	↗ Many countries in the study region exploit lucrative land mining operations and therefore do not (yet) consider moving mining operation offshore with imminent urgency ↗ None of the sponsoring States or companies for deep-sea mining are from the study region ↗ As deep-sea mining develops further, it could entail a new source of competition, potentially leading to the reconfiguration of markets and a market loss for exports from countries in the study region relying on land-based mining ↗ Considered as a promising future socio-economic interest in the study region; yet this would require significant investments in equipment and capacities	(Outcomes under this activity would result from decisions taken under the ISA and/or BBNJ agreement): ↗ The need to develop and/or strengthen EIA for mining activities in ABNJ ↗ Acknowledgement of the critical relevance to assess 'cumulative impact' and 'transboundary impact' when developing EIA ↗ Establishment of ABMTs to safeguard critical biodiversity areas against mining ↗ The adoption of global principles and approaches (e.g. precautionary and the ecosystem principles and the integrated approach) that should underpin mining activities in ABNJ ↗ The urgent need to operationalize the Enterprise, the entrepreneurial arm of the ISA, to act on behalf of mankind ↗ Enhanced scientific coordination to address BBNJ and mining matters ↗ Identification and assessment of impacts of activities in ABNJ underpinned by the best available scientific information. ↗ Improved coordination in decision-making between the BBNJ agreement and the ISA ↗ Multi-sector, integrated area-based management within ABNJ ↗ Countries implement procedures for the prevention, mitigation and management of potential adverse effects of mining activities in ABNJ Stronger multidisciplinary scientific advice to manage BBNJ

Ecosystem service	Socio-economic interests	Business as Usual with respect to socio-economic interest		Potential positive outcomes through ocean governance (incl. BBNJ agreement)
		Socio-economic outcomes at the global level	Socio-economic outcomes specific to the study region	
Non-consumptive activities				
Supporting	**Biodiversity**	↗ Biodiversity supports food security and sustains livelihoods through overall genetic diversity ↗ Biodiversity contributes to modern medicine and advancements in human health research and treatment ↗ Many species face an ongoing threat of extinction ↗ The extinction of one species can detrimentally affect other species or even entire ecosystems; biodiversity loss distorts the ocean's ecosystem services provision ↗ Biodiversity loss has critical implications for humanity, from the collapse of food and health systems to the disruption of entire supply chains, and reduced possibilities to understand ocean functioning and ecosystem services ↗ Measures are being taken to increase the protection of the ocean and its biodiversity and move towards more sustainable management. ↗ Spatial tools for identifying areas of special ecological importance, e.g. EBSAs based on scientific criteria under CBD, sites in ABNJ worldwide identified by other organizations, including BirdLife International, a partner of the STRONG High Seas project, Pew Charitable Trusts, Greenpeace and others	↗ The capture of keystone species, e.g. blue sharks disrupts the ecosystem functioning, due to their vital role in keeping prey population in check, feeding on diseased fish and thus preventing the spread of disease, and protecting the gene pool ↗ Similar socio-economic outcomes as those at the global level, with contextual variations	↗ Joint efforts and global policies to protect biodiversity ↗ Measures, instruments and mechanisms will benefit from a coordinated action at the national, regional and international level ↗ Innovative financing and capital markets, e.g. Blue Bonds, biodiversity offsetting catalysing conservation efforts
	Habitat provision	↗ Preservation of habitats benefits biodiversity: migratory and nursery habitats offer provisions for feeding, reproduction and juvenile maturation	↗ Similar socio-economic outcomes as those at the global level, with contextual variations	↗ Cover a major international regulatory gap in marine biodiversity conservation and sustainable use in ABNJ

Ecosystem service	Socio-economic interests	Business as Usual with respect to socio-economic interest		Potential positive outcomes through ocean governance (incl. BBNJ agreement)
		Socio-economic outcomes at the global level	Socio-economic outcomes specific to the study region	
Non-consumptive activities				
	Habitat provision	↗ Protects the gene pool of marine species, which is important to support robust populations and biological fitness ↗ Altering natural habitats even slightly can result in a domino effect that harms the entire ecosystem (tipping points). Habitat loss is a challenge for virtually all species ↗ Migratory species are particularly vulnerable to habitat destruction because they tend to inhabit more than one natural habitat		↗ The adoption of global principles and approaches (e.g. precautionary and ecosystem principles, and the integrated approach), which are fundamental for laying the foundation for future actions on habitat protection ↗ Area-based conservation measures, including MPAs are established in ABNJ for its role in protecting key habitat for species ↗ Establishment of models for international cooperation for BBNJ conservation through the establishment of a coherent network of marine protected areas ↗ Adoption of a decision-making process to establish, implement, monitor and review ABMTs for key habitat for species. ↗ Requirement for developing EIA for planned activities in areas requiring protection ↗ Investment in the building capacity on establishment, implementation, monitoring, management, and enforcement of ABMTs
Cultural	**Research and education**	↗ Increased awareness on the benefits and costs from conserving and sustainably exploiting ABNJ amongst selected target high-level audience; limited awareness among the general public ↗ Increasing fundraising opportunities related to high profile blue economy sectors, with engagement of private sector, limited to certain highly developed regions ↗ Unequal opportunities on access to research funds	↗ Limited research activities in the ABNJ of the study region ↗ Limited participation of universities and research institutes from the study region in national and international research activities in the ABNJ ↗ ABNJ are unexplored and less-accessible for the countries of the study region. ↗ Considered as a relatively new topic, which is still at the awareness-raising phase	↗ Enhanced international and cross-sectoral coordination and sharing of information ↗ Opportunities for creating specialized curriculum and research projects, in universities and other research and education centres ↗ Cooperation and collaboration between the BBNJ agreement and UNESCO on matters related to education, science, cultural heritage and biodiversity ↗ Investments on the promotion of international cooperation in marine scientific research and in the development and transfer of marine technology

Ecosystem service	Socio-economic interests	Business as Usual with respect to socio-economic interest		Potential positive outcomes through ocean governance (incl. BBNJ agreement)
		Socio-economic outcomes at the global level	Socio-economic outcomes specific to the study region	
Non-consumptive activities				
Cultural	**Recreation, leisure and tourism**	↗ Wildlife-based marine tourism related to migratory species is a source of revenue for local economies ↗ Protection of ABNJ biodiversity including migratory species of interest for wildlife-based marine tourism safeguards sustainability of activity ↗ Creation of jobs and entrepreneurship	↗ Increased dynamic capital markets as new currency brought to African countries ↗ Biodiversity loss in ABNJ impacts wildlife-based marine tourism in territorial waters (e.g. whale watching in Benin)	↗ The adoption and future implementation of the BBNJ agreement, through its objectives to conserve and sustainably use biodiversity is expected to benefit recreation, leisure and tourism, but mostly indirectly at present time, given these activities are not yet carried out in ABNJ
Regulating and maintenance	**Waste disposal (from offshore, e.g. shipping, and transported from land-based sources)**	↗ Waste can be diluted, absorbed and broken down (detoxified) in the marine environment. However, at the expense of significant harm to biodiversity and human health of both current and future generations ↗ Contamination of the marine environment by plastics, chemicals, oil and other pollutants. Toxic substances cause oxygen depletion, impact biodiversity and human health through the food chain and can ultimately impact fisheries, leading to negative social implications ↗ Marine debris can be ingested by or cause entanglement of organisms, posing direct threat to marine biota, ultimately causing broader impacts on ecosystem services ↗ Exposure of organisms to chemicals can lead to toxicological effects on fish, mammals and molluscs, impacting human health through the food chain ↗ Marine debris and ballast waters from ships serve as a vector in transporting species to non-native environments, leading to the introduction of invasive species that cause extensive ecological and economic damage to aquatic ecosystems	↗ The remote islands of Tristan da Cunha archipelago in the central South Atlantic Ocean, which have a high significance of global biodiversity and considered a natural World Heritage Site, are impacted by a very high macro debris load ↗ The biodiversity of the islands Tristan da Cunha is threatened by the introduction of invasive species ↗ Other negative effects on biodiversity and socio-economic outcomes are the same as the global costs with contextual variations	(Outcomes under this activity would result from decisions taken under IMO and/or the BBNJ agreement): ↗ Prohibition of disposing waste that cannot be assimilated back into the environment safely, from maritime processes or products ↗ Pollution prevention through proper disposal and waste reduction ↗ A change in public face and image of consumerism and recognition of the need for implementation of a circular economy. ↗ Waste understood as an inefficiency of the production process, resulting in a call for efficient waste management ↗ Improved coordination in decision-making between the BBNJ agreement and frameworks that regulate waste disposal within and beyond national jurisdiction ↗ The adoption of global principles such as the 'polluter pays' and the 'precautionary' principles, that should underpin regulations of waste disposal in the marine environment ↗ Enhanced scientific coordination to address BBNJ and waste management ↗ Adoption and application of global standards for EIA

Ecosystem service	Socio-economic interests	Business as Usual with respect to socio-economic interest		Potential positive outcomes through ocean governance (incl. BBNJ agreement)
		Socio-economic outcomes at the global level	Socio-economic outcomes specific to the study region	
Non-consumptive activities				
Regulating and maintenance	**Waste disposal (from offshore, e.g. shipping, and transported from land-based sources)**			↗ Acknowledgement of the critical relevance to assess 'cumulative impact' and 'trans-boundary impact' when developing EIA for waste disposal in ABNJ ↗ Identification and assessment of impacts of activities in ABNJ underpinned by the best available scientific information ↗ Countries incorporate procedures for the prevention, mitigation and management of potential adverse effects of waste disposal in ABNJ ↗ Area-based conservation measures are established including for its role in building resilience to stressors related to marine pollution
	Water circulation	↗ Transboundary transport of marine debris, litter and pollution causing harmful impacts on biodiversity and human health (see above) ↗ Disruption of ocean circulation as an impact of climate change	↗ Water circulation mediates the South Atlantic garbage patch that accumulates in the South Atlantic gyre (34–35°S) and is composed mainly of non-biodegradable plastic litter ↗ Other negative effects of transboundary transport of marine debris, litter and pollution on biodiversity are the same as the socio-economic outcomes at the global	
	Climate regulation	↗ Mitigation of impacts of climate change by absorbing excess heat, which also leads to increases in volume of water with potential effects on coastal areas ↗ Recognition of the importance of oceans in climate regulation, leading to more funds for research. This has been known by scientists for decades, but it's only recently that politicians are becoming more aware of the role of oceans in climate regulation	↗ Similar to the socio-economic outcomes at the global level, with contextual variations	(Outcomes under this activity would result from decisions taken under the UNFCCC and/or BBNJ agreement): ↗ Countries are guided by an approach to ABNJ conservation and sustainable use that aims to build ecosystem resilience to the adverse effects of climate change and ocean acidification and restores ecosystem integrity

Ecosystem service	Socio-economic interests	Business as Usual with respect to socio-economic interest		Potential positive outcomes through ocean governance (incl. BBNJ agreement)
		Socio-economic outcomes at the global level	Socio-economic outcomes specific to the study region	
Non-consumptive activities				
Regulating and maintenance	**Climate regulation**	↗ The economic benefits and valuation of the regulatory services provided by ABNJ in relation to climate regulation are extremely difficult to quantify ↗ The near-term impacts of climate change add up to a global emergency that will include loss of life, social and geopolitical tensions and negative economic impacts		↗ Area-based conservation measures are established in ABNJ including for its role in building resilience to stressors related to climate change and ocean acidification ↗ Transition from carbon intensive to carbon-neutral industries ↗ Adverse effects of climate change are widely recognized as a stressor on the marine environment and BBNJ; hence higher investments are made on capacity building and technology transfer on this matter ↗ Increased efforts in monitoring and forecasting of changes in the ocean to inform adaptation planning and implementation ↗ Improved and intensified coordination and cooperation in decision-making between the BBNJ agreement and UNFCCC ↗ Enhanced scientific coordination to address BBNJ and climate change matters ↗ Accelerate the global transition to climate neutrality
	Carbon sequestration and storage	↗ The ocean holds about fifty times more CO_2 than the atmosphere, acting as a sink for atmospheric carbon, slowing climate change ↗ Increased levels of CO_2 in the atmosphere, produced mainly by the burning of fossil fuels, is causing ocean acidification. ↗ Higher acidity makes it difficult for marine organisms, such as coral and some plankton, to form their shells and skeletons, and may cause existing shells to dissolve ↗ Identifying suitable places for storage of captured CO_2 is highly dependent on future research	↗ Similar to socio-economic outcomes at the global level, with contextual variations	↗ Same as box above

Ecosystem service	Socio-economic interests	Business as Usual with respect to socio-economic interest		Potential positive outcomes through ocean governance (incl. BBNJ agreement)
		Socio-economic outcomes at the global level	Socio-economic outcomes specific to the study region	
Non-consumptive activities				
Regulating and maintenance	**Carbon sequestration and storage**	↗ The economic benefits and valuation of the regulatory services provided by ABNJ in relation to carbon sequestration and storage are extremely difficult to quantify		
Other (ecosystem-state independent)	**Navigation and transport/ shipping**	↗ Enables growing international trade ↗ Maritime transport is a growing emitter of greenhouse gases and a major source of pollution, including air pollution, oil spills and waste disposal, causing broader impacts to ecosystem	↗ Increasing container volumes and ship sizes have exacerbated the need to improve port infrastructure and move towards deep-water terminals that are able to process larger and more efficient ships better ↗ Inadequate port infrastructure generating environmental degradation and coastal erosion ↗ Capitalizing on early stages of investment and planning (for new or upgraded port infrastructure and low emission ships) to integrate sustainability principles and criteria to reach ambitions of a sustainable blue economy	(Outcomes under this activity would result from decisions taken under IMO, RFMOs, and/or the BBNJ agreement): ↗ Area-based conservation measures, including MPAs, are established in ABNJ for safeguarding biodiversity against any harmful impacts resulting from maritime traffic ↗ The adoption of global principles and approaches (e.g. precautionary and the ecosystem principles and the integrated approach) that should underpin shipping activities in the high seas ↗ Enhanced scientific coordination to address BBNJ management and shipping matters ↗ Adoption and application of global standards for EIA, including on shipping activities that impact biodiversity ↗ Multi-sector, integrated area-based management within ABNJ
	Submarine cables/ tele-communication	↗ Facilitate communication at the global level through fibre optics ↗ Risk of deterioration of infrastructure (voluntary or non-voluntary) ↗ Deterioration of local habitats; loss of biodiversity	↗ Help bridge the technology/communication gap in the study region ↗ Facilitate access to education and finance for most vulnerable populations	↗ Area-based conservation measures, including MPAs are established in ABNJ for safeguarding biodiversity against any harmful impacts derived from submarine cable laying and maintenance ↗ The adoption of global principles and approaches (e.g. precautionary and the ecosystem principles and the integrated approach) that should underpin cable laying activities in ABNJ ↗ Decisions on activities to be undertaken in ABNJ will be guided by the best available scientific information

Ecosystem service	Socio-economic interests	Business as Usual with respect to socio-economic interest		Potential positive outcomes through ocean governance (incl. BBNJ agreement)
		Socio-economic outcomes at the global level	Socio-economic outcomes specific to the study region	
Non-consumptive activities				
Other (ecosystem-state independent)	**Submarine cables/ tele-communication**			↗ Adoption and application of global standards for EIA, including on cable laying and related activities that impact biodiversity ↗ Multi-sector, integrated area-based management within ABNJ
	Maritime security	↗ Increased level of security instils confidence in investors and other private sector stakeholders, leading to social and economic development	↗ Piracy and IUU are major security issues in the study region ↗ Lack of security results in lower investments, uncontrolled use of resources putting pressure on the environment	↗ Agreements on procedures to allow States to exercise naval freedom of navigation and other operations whilst biodiversity management needs are addressed, particularly in interrelated spatial areas ↗ ABNJ areas reserved for peaceful purposes ↗ Positive relationship between States in governing areas of the global commons, such as the Antarctic Treaty or the Convention on International Civil Aviation (Chicago Convention) ↗ Compromised interests between national security issues and biodiversity conservation and sustainable use

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7. Annex

Data shown in Figures 4 (B) and Figure 5

	Figure 4 (B)		Figure 5 (A)		Figure 5 (B)	
Country	**Youth (age 15–24) unemploy-ment rate (%)**	**Year**	**% population living below national poverty lines**	**Year**	**GINI Index (%)**	**Year**
Angola	16.7	2011	36.6	2008	51.3	2018
Benin	5.6	2011	40.1	2015	47.8	2015
Cabo Verde	27.8	2018	35.0	2015	42.4	2015
Cameroon	6.3	2014	37.5	2014	46.6	2014
Congo, Dem. Rep.	8.7	2012	63.9	2012	42.1	2013
Congo, Rep.	40.0	2005	40.9	2011	48.9	2012
Cote d'Ivoire	5.5	2017	46.3	2015	41.5	2015
Equatorial Guinea			76.8	2006		
Gabon	35.7	2010	33.4	2017	38.0	2017
Gambia, The	25.8	2018	48.6	2015	35.9	2016
Ghana	9.1	2017	23.4	2016	43.5	2016
Guinea	5.7	2002	55.2	2012	33.7	2012
Guinea-Bissau			69.3	2010	50.7	2010
Liberia	2.3	2016	50.9	2016	35.3	2016
Mauritania	21.2	2017	31.0	2014	32.6	2014
Namibia	38.0	2018	17.4	2015	59.1	2015
Nigeria	18.3	2019	46.0	2009	43.0	2009
Sao Tome and Principe	20.8	2012	66.2	2010	56.3	2017
Senegal	8.1	2015	46.7	2011	40.3	2011
Sierra Leone	9.4	2014	52.9	2011	35.7	2018
South Africa	57.1	2019	55.5	2014	63	2014
Togo	9.5	2017	55.1	2015	43.1	2015

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About the STRONG High Seas project

The STRONG High Seas project is a five-year project that aims to strengthen regional ocean governance for the conservation and sustainable use of marine biodiversity in areas beyond national jurisdiction. Working with the Secretariat of the Comisión Permanente del Pacífico Sur (CPPS; Permanent Commission for the South Pacific) and the Secretariat of the West and Central Africa Regional Seas Programme (Abidjan Convention), the project will develop and propose targeted measures to support the coordinated development of integrated and ecosystem-based management approaches for ocean governance in areas beyond national jurisdiction (ABNJ). In this project, we carry out transdisciplinary scientific assessments to provide decision-makers, both in the target regions and globally, with improved knowledge and under- standing on high seas biodiversity. We engage with stakeholders from governments, private sector, scientists and civil society to support the design of integrated, cross-sectoral approaches for the conservation and sustainable use of biodiversity in the Southeast Atlantic and Southeast Pacific. We then facilitate the timely delivery of these proposed approaches for potential adoption into the relevant regional policy processes. To enable an interregional exchange, we further ensure dialogue with relevant stakeholders in other marine regions. To this end, we set up a regional stakeholder platform to facilitate joint learning and develop a community of practice. Finally, we explore links and opportunities for regional governance in a new international and legally binding instrument on marine biodiversity in the high seas.

Project duration: June 2017 – May 2022
Coordinator: Institute for Advanced Sustainability Studies (IASS)
Implementing partners: BirdLife International, Institute for Sustainable Development and International Relations (IDDRI), International Ocean Institute (IOI), Universidad Católica del Norte, WWF Colombia, WWF Germany
Regional partners: Secretariat of the Comisión Permanente del Pacífico Sur (CPPS), Secretariat of the Abidjan Convention
Website: prog-ocean.org/our-work/strong-high-seas
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Partners of the STRONG High Seas project: